Periodical
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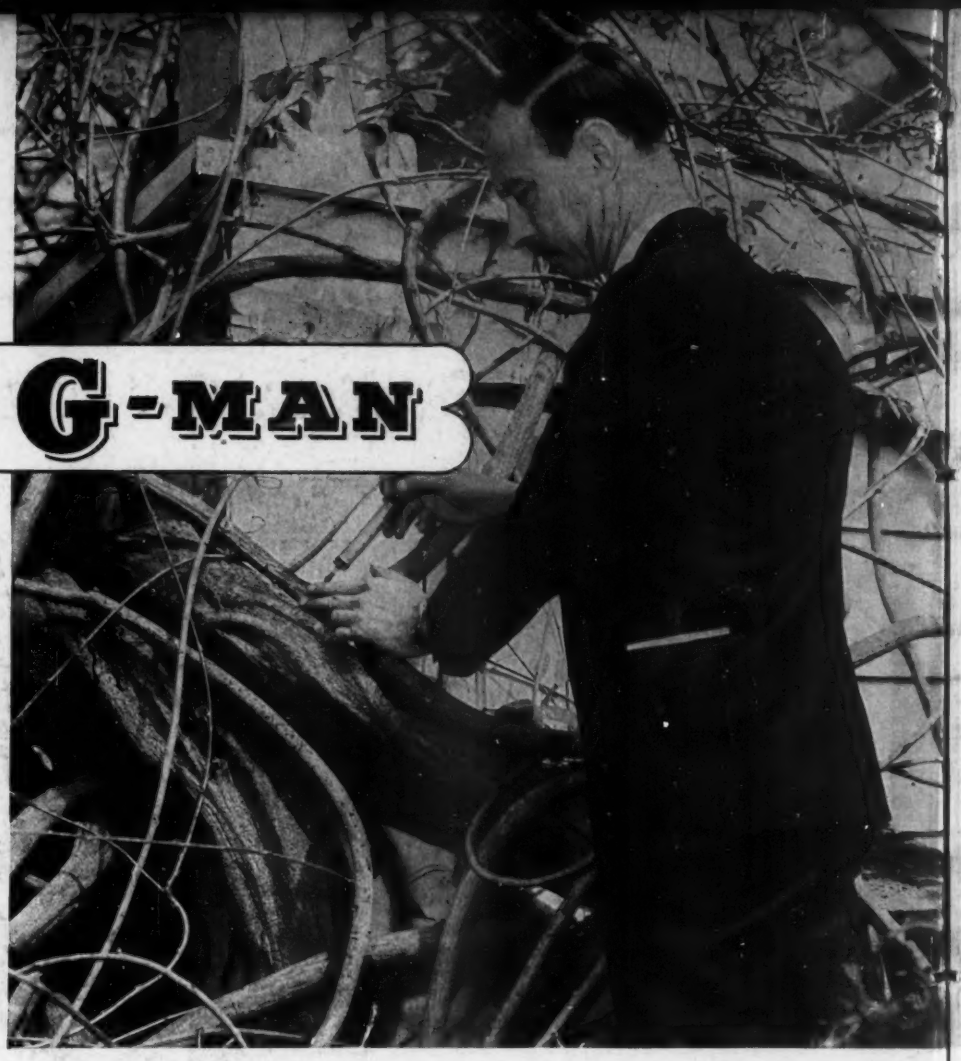
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

RARY
1942
ROIT

The Shop Teachers' Professional Magazine

JANUARY, 1943 VOL. 32, No. 1

THE VITAMIN G-MAN



Mr. George C. Warner of Pasadena, California, injecting his Vitamin B_1+ solution into wistaria vine

RECENTLY the country has been stirred by the story of a man who has worked wonders with plants and trees. By the administration of Vitamin G (generally known as Vitamin B_1), aged and failing trees regain their youth, orchards are brought to fruit-bearing maturity in one-fourth normal time, plants bloom several times a year.

The story of the "Vitamin G-Man" is another dramatic example, not only of the miracles men are constantly working, but of how living things may be stimulated, shaped, molded almost at will. As able educators know, there is always more ability locked in human breasts than mere usual circumstance can reveal . . . that most youngsters in their care possess a spark of achievement which is doomed to die unless fanned to flame by proper inspiration and development. They know that beyond mere teaching, the true educator grasps as his responsibility the opportunity to give a youngster a vision of the things he can accomplish and then set him moving surely toward the goal.

By quiet suggestion; by capitalizing on a youngster's natural interests; by relating familiar routine to its counterpart in great achievement: thus a boy's feet are planted on the solid ground that must bridge the gap between him and his slumbering ambition. Few have greater opportunity in this respect than the instructor in mechanical drawing. For in his subject and in the drawing instruments his students use he has the concrete foundation on which dreams are built into great achievements. No creative artist ever belittled the tools of his art. Respect-worthy tools give their possessor a self-respect which transfers to the work he does, strengthening and dignifying the dream he is trying to transform into steel and stone, flesh and blood. All-important is a student's introduction to his subject. It *cannot* be careless, haphazard. All-important is the drawing set he first uses. Its selection cannot be careless or haphazard either. The proper choice may well shape the whole future of a man in the years to come.

EUGENE DIETZGEN CO.

Chicago • New York • San Francisco • New Orleans • Pittsburgh
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Dealers in All Principal Cities

Your Requirements vs. NATIONAL SECURITY

● The demand for Dietzgen Drawing Instruments today greatly exceeds the present available supply. First, the national wartime requirements are making a tremendous demand on our production capacity. Second, the critical materials used in making Dietzgen quality instruments impose a drastic limitation on production for other than the needs of our armed forces and essential war production. Your tolerant understanding of this situation is appreciated.

DIETZGEN

EVERYTHING FOR DRAFTING AND SURVEYING

R v.32 1943

HOW TO GET THE MOST OUT OF YOUR LATHES

No. 3 in a series of suggestions made by the South Bend Lathe Works in the interest of more efficient war production

Keep Your Lathes Level

The leveling of a lathe can either perpetuate or destroy the best craftsmanship of the machine tool builder. A lathe that is not kept perfectly level cannot turn out the precision work for which it was built.

The lathe bed is comparable to a toolmaker's surface plate. Upon it rest the headstock, carriage and tailstock. Therefore, any twisting of the lathe bed will throw the headstock, tailstock and carriage out of alignment. This will cause the lathe to turn or bore a taper instead of taking a straight cut. It will also cause the alignment of the tailstock center point to shift as the tailstock is moved along the lathe bed, necessitating constant readjustment of the tailstock top set-over.

Every lathe should be checked periodically to see that it is level

Check Leveling Frequently

The major cause of distortion in lathe beds is the settling of the floor supporting the lathe. This is most commonly encountered in buildings that do not have solid foundations or that have wooden floors or columns. There are numerous other conditions which can cause this, such as the shifting of loads on the floor, swelling of wood flooring, deterioration of wooden shims, and atmospheric changes. For these reasons, every lathe should be checked periodically to see that it is level.

How to Level a Lathe

The first requisite for accurate leveling is a precision level at least 12" long. One that is sufficiently sensitive to show a distinct movement of the bubble when a .003" shim is placed under one end of it. A carpenter's level, a combination square level, or an ordinary machinist's level cannot be used because they are not sufficiently sensitive.

The leveling of the lathe is tested by placing the level squarely across the lathe bed, immediately in front of the headstock, and also at the extreme right end of the bed. On lathes having long beds, tests should also be made at one or more intermediate positions. Be sure that the ways are wiped perfectly clean of all chips or dirt before using the level.

Metal shims should be used under the lathe at the points indicated by the level as being low. Some lathes are equipped with leveling screws making it unnecessary to use shims.

After all adjustments have been made, bolt the lathe securely to the floor and repeat the tests to make sure that tightening the leg bolts has not affected the leveling of the lathe.

Alignment Test

A simple alignment test can be used to check the leveling of a lathe. Place a bar of steel, one inch or larger in diameter, in the chuck and machine two collars of equal diameter three or four inches apart. Then, take a very light finishing cut across both collars without changing the setting of the cutter bit. Measure both collars with a micrometer. If the collars are not the same diameter, it is an indication that the lathe is not level. Adjust the leveling until, when a cut is taken, both collars are turned the same diameter.

Write for Bulletin H3

Bulletin H3 giving more detailed information on the installation and leveling of lathes will be supplied on request. Also reprints of this and other* advertisements and bulletins in this series. State quantity.

*Ad. No. 1, "Keep Your Lathe Clean"
Bulletin H1, "Keep Your Lathe Clean"
Ad. No. 2, "Oiling the Lathe"
Bulletin H2, "Oiling the Lathe"

SOUTH BEND LATHE WORKS
South Bend, Ind., U. S. A. • Lathe Builders for 36 Years

Ref

You'll get maximum output from your vocational training facilities when you teach welding with versatile MARQUETTE A. C. machines.

Superior arc performance and exceptional simplicity of operation of these rugged welders helps students to quickly master the fundamentals of this vital war-time skill and more easily gain the manual proficiency needed for war work in either A.C. or D.C. welding.

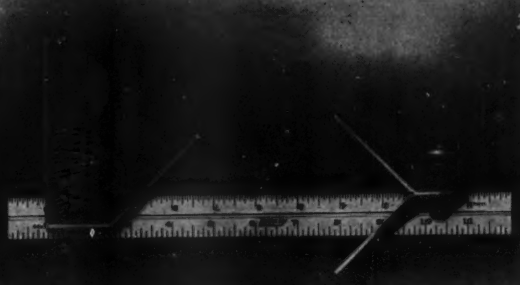
Sturdily built for hard usage, with all-asbestos insulation, and completely equipped, with nothing more to buy, MARQUETTE Welders are the ideal machine for shop class work. Prompt shipment now being made on priority rated orders.

Send for free, 24 page, illustrated booklet.

MARQUETTE MFG. CO., INC. MINNEAPOLIS, MINN.

MARQUETTE
REG. U.S. PAT. OFF.
A.C. ARC WELDERS

Every School Shop needs this versatile tool



LUFKIN COMBINATION SQUARE TOPS THE FIELD

This precision built tool, consisting of a tempered, machine-divided blade with square and center heads (cast or drop-forged) has so many varied uses as to be virtually indispensable to all mechanics working with metals.

Heads can be securely set quickly and accurately. Square heads have level glass and steel scriber. Graduated English or metric.

. . . Teach Good Workmanship With Good Tools . . .

LUFKIN
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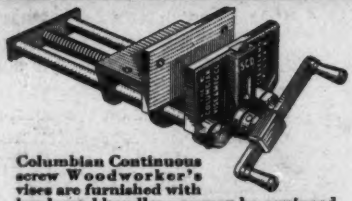
TAPES · RULES · PRECISION TOOLS

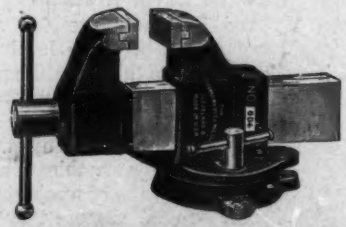
COLUMBIAN VISES

INDUSTRY'S FIRST CHOICE FOR OVER THIRTY YEARS



Columbian Continuous screw Woodworker's vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.

The complete line of Columbian Vises is designed to excel in its field—all are made to the same high standard of engineering and workmanship. A vise for every need and purpose.



Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

THE COLUMBIAN VISE & MFG. CO.
9022 BESSEMER AVENUE CLEVELAND, OHIO
THE WORLD'S LARGEST MAKERS OF VISES

WAR WON'T WAIT so, around a Black & Decker ⅛" Utility Drill, Aircraft Mechanics, Inc., built this special device for dressing the side edges of bearings. Device pulls up instead of bearing down.

A LESSON IN INGENUITY!

When machine tools can't be had

Black & Decker Tools do the Job!

THEY COULDN'T GET THESE

SO HERE'S WHAT THEY DID!

Aircraft Mechanics, Inc., needed equipment to start quantity production of welded steel structures for airplane engine mounts and landing gear . . . they couldn't get machine tools for months. But that didn't stop 'em! By combining ingenuity with Black & Decker Tools, they built special equipment—saved *3 to 4 months*, starting war production.

The case of Aircraft Mechanics is *not* unusual. Throughout war industry, other ingenious producers have also combined brains and Black & Decker Tools to keep vital production rolling. It's up to men like *you*—who train America's production rookies—to stress the need for this sort of ingenuity and adaptability in cases of emergency. If your students know how to adapt tools to "special" jobs, they'll be that much better equipped to do *all* jobs well. Write for our new booklet, "They Used Their Heads," showing other ingenious methods of solving unusual production problems, with the aid of Black & Decker Tools. A copy is yours for the asking. The Black & Decker Mfg. Co., 780 Pennsylvania Ave., Towson, Maryland.

IN A RADIAL ARM of their own design, Aircraft Mechanics, Inc., uses another Black & Decker Drill to do the work of a 48" radial drill press, for drilling operations on aircraft engine mounts.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC **TOOLS**

IN ANOTHER "HOME MADE" JIG, on which a hand-turned thumbscrew exerts a pulling up action, a Black & Decker Utility Drill is used for dressing—or "spot facing"—the under sides of bearings. This work is done accurately and quickly.

"IT'S TOUGH ON THE DRILLS—BUT THEY CAN TAKE IT!" says Aircraft Mechanics, Inc. Here they have used a Black & Decker Utility Drill in building their own horisontal drill press. According to their report, this outfit is very fast and is doing the same work as a big 60" radial drill press. A new free booklet—called "They Used Their Heads"—illustrates more such ingenious adaptations of Black & Decker Tools. For a copy, address: The Black & Decker Mfg. Co., 780 Pennsylvania Ave., Towson, Maryland.

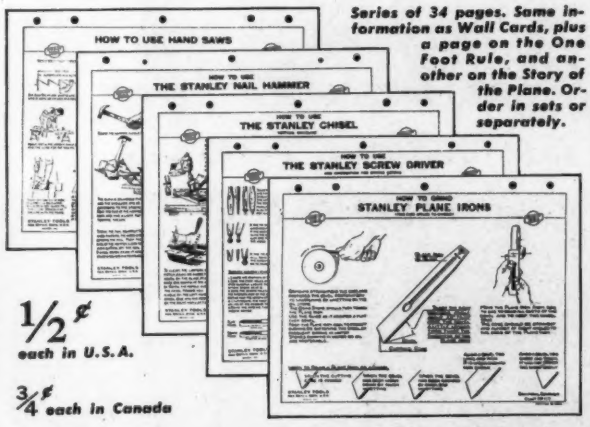
Save Time
in teaching Tool Care and Use

—with STANLEY WALL CARDS

16 Cards, 14" x 18", printed both sides, 32 subjects in all. Printed on heavy cardboard, lacquered for easy cleaning. Hooks for hanging furnished.

$1.50 *per set Delivered anywhere in U.S.A. (2.25 per set in Canada)*

—with STANLEY NOTEBOOK PAGES



Series of 34 pages. Same information as Wall Cards, plus a page on the One Foot Rule, and another on the Story of the Plane. Order in sets or separately.

½¢ *each in U.S.A.*

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These Stanley visual teaching aids are essential equipment in hundreds of school shops. Presenting tool facts with few words and many illustrations, they reduce the time necessary to explain each tool to a minimum, and are constant reminders of proper practice. Offered at our cost for printing and postage. Order sets for your shop today. Complete list of subjects sent on request.

STANLEY TOOLS

DIVISION OF THE STANLEY WORKS

EDUCATIONAL DEPT., NEW BRITAIN, CONN.

Ready February 1st—

FOR YOUR

Pre-Induction Course in

FUNDAMENTALS OF SHOPWORK

Jones and Axelrod's

INTRODUCTORY SHOPWORK

Especially designed for the Pre-Induction Course in Fundamentals of Shopwork recommended by the War Department and the U. S. Office of Education, this book fully covers the topics suggested. Includes use and care of tools, measuring and gaging, woodworking and metal-working, wiring, wire-splicing, and ropework, splices and knots. Carefully explains every step of shopwork, from correct ways of handling and using tools, to efficient methods of doing jobs. Illustrations show how to carry out jobs in the most efficient way. *Probable price, $2.00.*

Send for a copy on approval.

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ARMSTRONG
TOOL HOLDERS AND TOOLS

Teach with the tools actually used in industry.

With ARMSTRONG TOOL HOLDERS—used in over 96% of the Machine Shops and Tool Rooms. Develop "tool sense" and a love for fine tools with ARMSTRONG Drop Forged WRENCHES—Carbon and Chrome-Vanadium Steel Open End Wrenches; Box Socket improved designs, better balance, finer and Detachable Socket Wrenches with machining and finish. Set up jobs with modern, safe ARMSTRONG Drop Forged Setting-Up Tools. Use ARMSTRONG Drop Forged Clamps that never slip, spring or spread, and ARMSTRONG Drop Forged Lathe Dogs that are standard everywhere.

Write for Cutter Grinding Charts and new C-39 Catalog. Sent to Instructors upon request.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

322 N. Francisco Ave., Chicago, U. S. A.

Eastern Warehouse & Sales Office: 199 Lafayette St., N. Y.

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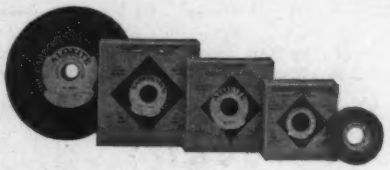
WEAPONS FOR PRODUCTION

● In war plants all over the country these products by Carborundum are proving "Weapons for Production" by speeding output of vital war materials.

Because your students will probably be filling vital war jobs soon, it is important that they become familiar with these industrial tools while they are learning. By making use of these various abrasive products—grinding wheels, sharpening stones, coated abrasives—in your shop classes you give your students a chance to get the feel of industry's "Weapons for Production."

GENERAL PURPOSE WHEELS



In school machine shops Carborundum Brand Silicon Carbide Wheels grind low-tensile materials like brass and cast iron. For high-tensile steels and alloys they need Aloxite Brand Aluminum Oxide Wheels.

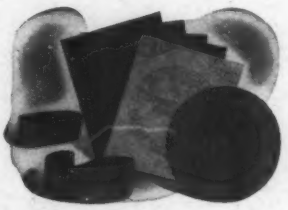
SHARPENING STONES

Wherever edged tools are used, there's vital need for these Carborundum Brand sharpening stones. Available in both straight and combination grits, there's a correct grit and size for every sharpening need.

METAL FINISHING CLOTH

In modern school shops an endless number of jobs are being done with Aloxite Brand Aluminum Oxide Coated Abrasives. Aloxite Brand Cloth is indispensable for metal finishing, removing rust, fitting metal parts, cleaning up for brazing. Available in sheets, discs or Economy Rolls.

SANDING PAPER



No woodworking shop is complete without these Carborundum-made coated abrasives. They produce smooth, uniform finishes and make short work of tough jobs like removing excess glue. Order Aloxite Brand Aluminum Oxide Electrocoated "K5"-R or Garnet Paper in sheets, belts or discs.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

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Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

Carborundum, Aloxite and K5 are registered trade-marks of and indicate manufacture by The Carborundum Company

PROTECT STUDENTS' EYES FROM GRINDING HAZARDS!

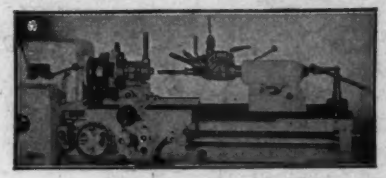
SQUARE BAR PREVENTS SWINGING OUT OF POSITION
FIXTURE CAN BE PIVOTED OUTWARD TO REMOVE BULBS
LIGHT FIXTURE MOUNTED ON RUBBER BUSHINGS
REFLECTOR
2 BAYONET TYPE BULBS WITH SUPPORTED FILAMENTS FURNISHED WITH EACH EYE SHIELD
RUBBER PADS UNDER CLAMPS
SAFETY GLASS ON TOP, WINDOW GLASS UNDERNEATH
GLASS SIZE 4" x 6"
STURDY DIE CAST FRAME

STANLEY "Flud-Lite" EYE SHIELD

Gives positive eye protection with excellent light directly on the work. Adjustable up and down for standing or sitting position. Cannot be moved to non-guarding position without dismantling. Can be easily applied on bench or belt-driven grinders. Write for details. Stanley Electric Tool Div., The Stanley Works, 112 Elm Street, New Britain, Conn.

STANLEY Electric Tools

ANY ENGINE LATHE CAN BE CONVERTED INTO *A Turret Lathe* IN 15 SECONDS

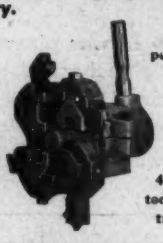


Train TURRET LATHE Operators on your ENGINE LATHE

Turrets applied to 16" lathe

5-tool tail-stock turret

• This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held. *15 days delivery.*



pat. pending

4-tool tool-post turret

• Then there's the completely modernized 5-tool TAIL-STOCK TURRET (above), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. All tools are precision made attachments which will convert any engine lathe into a production turret lathe. *15 days delivery.*

Write for a bulletin of these and other JEFFERSON TOOLS!

JEFFERSON MACHINE TOOL CO.
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TABLE SIZE 32" x 8"

QUICK DELIVERY BY LARGE SCALE PRODUCTION

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Atlas TOOLS TO SPEED WAR PRODUCTION TRAINING

LATHES Atlas F-Series 10" Lathes are turning out millions of vital small parts in hundreds of war plants. On 24-hour production schedules and in the hands of your trainees, these accurate, ruggedly designed, backgeared, screw-cutting lathes can "take it." They offer precision training and experience to your students, at low cost.

DRILL PRESSES

Basic tools in *any* plant, *good* drill presses are essential to good student training. Atlas Drill Presses with 4 SKF ball bearing "floating drive" spindle design, have the strength and rigidity for accuracy day after day, under the toughest conditions. That's why they are first choice in many a key plant . . . and mighty good reasons for using them in war production training!

Complete specifications and job applications for Atlas 10" Lathes, Drill Presses, Shapers, and Milling Machines will gladly be sent on request.

ATLAS PRESS CO.
171 N. Pitcher Street
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ATKINS

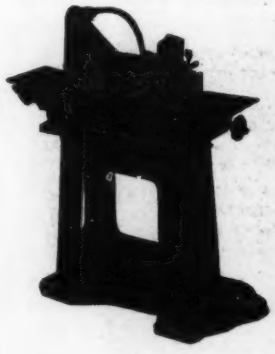
Training Tells

● Unable, under wartime conditions, to give new workers the customary "breaking in" period on valuable tools and equipment, industry depends more than ever before on the manual training teacher. This places an extra responsibility on the teacher—solved in part by training pupils on industry-accepted tools like Atkins Saws. Correctly designed, finely made, and quality throughout, training on Atkins Saws will stand your students in good stead when they switch from school to shop. When requisitioning saws, remember—"Atkins Training Tells!"

Send for FREE Wall Chart Illustrating Saw Fitting

E. C. ATKINS AND COMPANY 404 S. Illinois St., Indianapolis, Indiana

WALLACE No. 10 JOINTER



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8" Capacity. Rabbets up to ¾" deep. Four-knived cutterhead. Knives set askew to take whittling cut. Timken taper roller bearings. Semi-steel tables. Direct-connected G. E. motors for 3600 r. p. m., or geared motors for 5200 r. p. m.

What a Jointer! This quality-built Wallace No. 10 Model has power—speed—capacity and accuracy in a measure never known before!

Smooth-running, quiet; efficient, it guarantees perfect glue joints,—smooth, clean surfacing work that seldom requires sanding. Economy is certain,—the fine-quality construction holds maintenance costs to a very minimum.

Write today for bulletin,—we also manufacture high-grade universal saws, bandsaws, cut-off saws, shapers, mortisers, grinders, lathes, etc.

J. D. WALLACE & COMPANY

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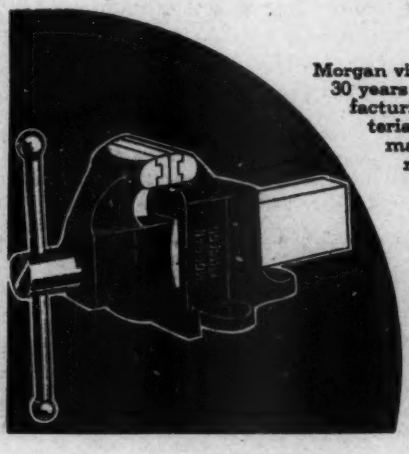
Try out

The vise used in thousands of school shops throughout the country.

MORGAN VISES



Morgan vises represent more than 30 years of experience in manufacturing vises. The best materials and exacting workmanship means strong, rigid and long lasting service in Morgan Vises. Can be had in various sizes and styles . . . . Write for literature and prices.

MORGAN VISE CO.

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Can Vocational Training Be Simplified?

YES!...with WALKER-TURNER MACHINE TOOLS

20 INCH DRILL PRESSES

Available with hand or power feed, in bench, floor and multiple spindle models. Drill to center of 20" circle. Feed 6". Capacity 1" in cast iron, ¾" in steel. Spindle speeds 260-5200 r.p.m. Also 15" hand feed drill presses, in bench and floor models.

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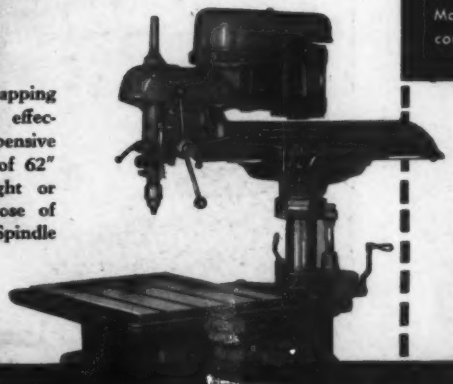
14" and 16" models. Back-gearing and cone pulleys provide speed range from 61 to 5300 s.f.m. for cutting practically any material from steel to wood. Ruggedly constructed, fully safe-guarded, easily operated.

RADIAL DRILL

Handles light drilling, tapping and routing operations as effectively as larger, more expensive machines. Drills to center of 62" circle. Head tilts 45° right or left. Maximum distance nose of chuck to table, 13½". Spindle traverse, 3¾".



THE less complicated the instruction — the quicker, more thoroughly trainees get the "knack" of industrial operations. Walker-Turner Machine Tools are ideal for training men and women in modern production methods, because they are simplified in design — easy and safe to operate — and are practical production tools used by the thousands throughout the war industries.

Walker-Turner Machine Tools are carefully designed and engineered to high standards of accuracy. They are ruggedly built to stand up under 24-hour training schedules and the abuse of inexperienced handling. Moreover, Walker-Turner Machine Tools are low in cost and are available promptly for war production training.

NEW CATALOG—*Just Off the Press*

Gives detailed information and specifications on the complete line of Walker-Turner Machine Tools. Profusely illustrated. Send coupon for your copy.

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Please send your new Machine Tool Catalog.

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School .....
Street .....
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METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Training Today..

PRODUCING TOMORROW

WITH

RACINE HYDRAULIC Utility Saws

RACINE Utility Saws are capable of doing all types of cutting operations, including 45 degree angles. Despite these advantages their small, but sturdy size conserves valuable space.

Increasing skilled labor shortages demand that replacements today be trained FAST. Vocational training . . . with RACINE Hydraulic Utility Saws . . . is a sure means of speedily but thoroughly converting today's youth into the producing veteran of tomorrow.

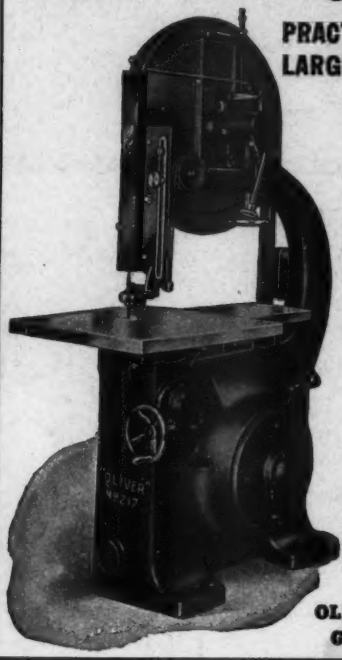
RACINE TOOL & MACHINE CO.

State and Carlyle Racine, Wisconsin, U. S. A.

"Oliver" No. 217

Automatic Brake

Band Sawing Machine



PRACTICAL EQUIPMENT FOR LARGE OR SMALL SCHOOLS

Some of the special features of the No. 217 Band Saw, are the automatic brake for the upper wheel; the oil immersed, self-locking tilting device for the table; the foot brake which shuts off the current and stops the machine quickly and the dust collecting system.

Send for information on this band saw or any of the following machines.

Saw Benches	Shapers
Cut off saw	Wood Trimmers
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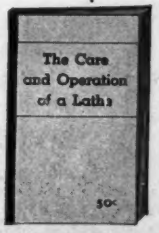

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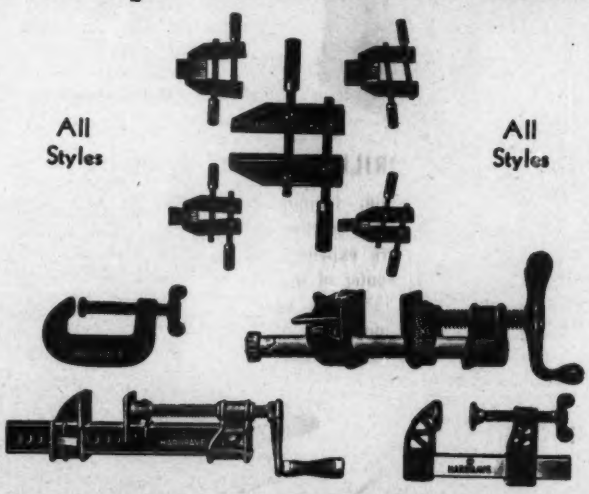

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOL. 32 JANUARY, 1943 Number 1

SEASON'S GREETINGS

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION wishes its many readers the peace which Christmas symbolizes. It also hopes that the year 1943, in spite of the troubles into which the world has been plunged, will be auspicious and filled with contentment and the satisfying peace which the world so sorely needs.

THIS MONTH'S COVER

The cover illustration chosen for this month shows one of the women trainees being prepared to enter wartime industries in one of the Detroit public schools. The trainee pictured is drilling rivet holes. Women workers become quite adept in the aircraft industries as riveters.

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(2) Careful operation. Two common operating faults which cause saw breakage are feeding the work too quickly at the start of the cut and sawing around a small radius with a wide blade.

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Short Talks on Wood

HACKBERRY (*Celtis occidentalis*)

Sometimes called Sugarberry which is an entirely different species, although both are marketed under the name of Hackberry. The wood is moderately hard and heavy, shock-resisting and fairly durable. Rather coarse-grained but easy to work. Somewhat yellow in color.

It is used for furniture, agricultural implements, rough construction, boxes, crates and fuel. Often sold with ash, hence the reported cut is not a true indication of the annual output.

Hackberry is found from New England to Virginia and westward to North Dakota and Kansas. Prefers the rich, moist soil along streams and rivers. Seldom occurs in pure stands. Is usually associated with elm, walnut, hickory and ash.

Grows to a height of 20 to 70 feet and a diameter of 2 to 3 feet. Has a long, straight trunk and an open, rounded crown. Twigs are often grouped in dense clusters known as "witches-brooms" which are actually abnormal growths caused by insect attack. The root system is deep and spreading. Thrives under adverse conditions of growth. Is used extensively for street and ornamental planting.

The bark is smooth and gray and is broken by numerous wart-like projections on the older trees. The leaves are simple, alternate, ovate, 2 to 4 inches long, finely toothed along the margin, lopsided and rough on the upper surface. Can be confused with the elm leaf but is more taper-pointed. Fruit is a round, dark-purple berry about ¼ inch in diameter.

To date, forty-one brief articles similar to the one above and dealing with the more commonly used woods have appeared in these ads. As in the past, we continue to invite your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

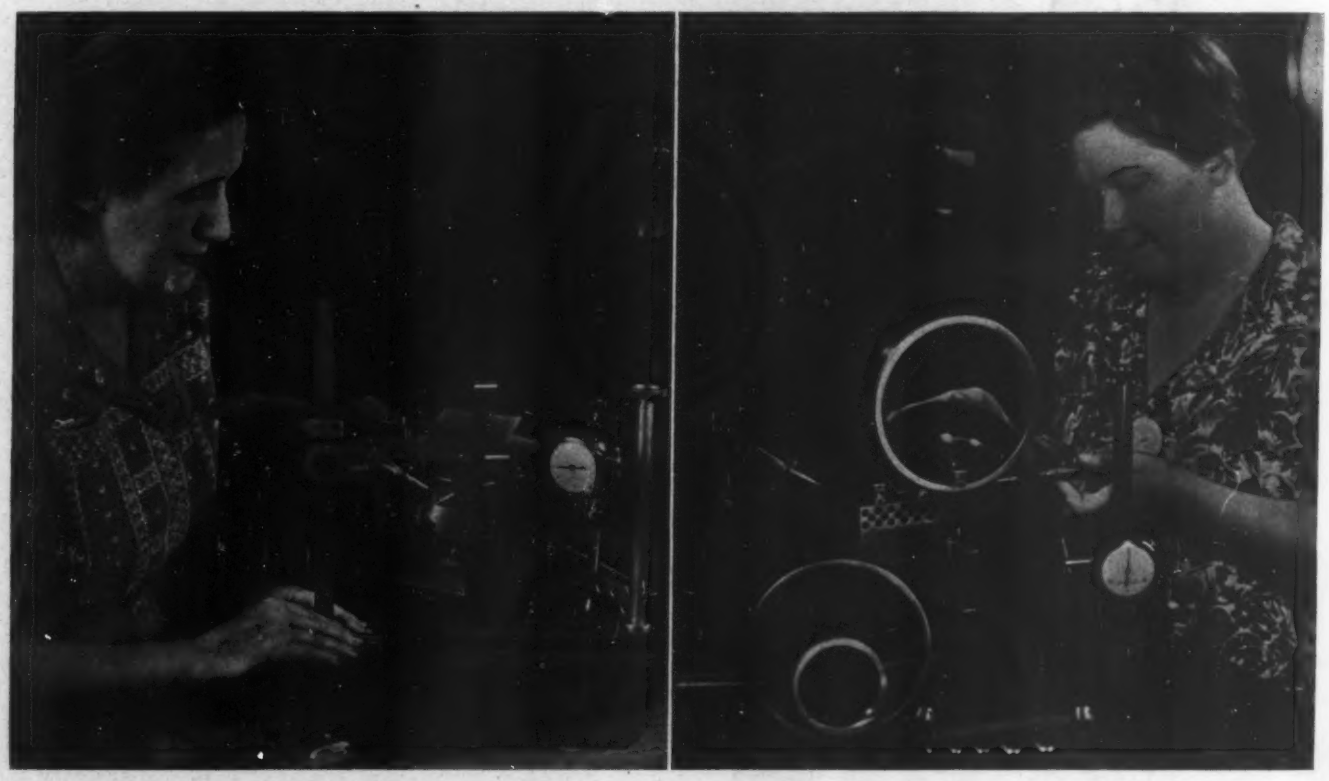
Training Women for Wartime Industries

EARL L. BEDELL*

The public schools and vocational education in particular have demonstrated their ability to meet the changing demands of our state and nation. In 1940 the schools responded to the call to train workers for the rapidly accelerating defense industries and promptly developed a suitable program for the training of those on the W.P.A. rolls and those registered with the United States Employment Service. Following closely came the need for conversion training as the factories began changing over from civilian to military production. When war finally came upon us a vast vocational training program was well under way, but since that fateful December 7 our wartime industries have been steadily speeded up until now it has been necessary to recruit labor from the ranks of women. Now vocational education is ready to meet the necessity of training thousands of women who have left their homes and volunteered their services as workers in this vast industrial army. So efficiently have the vocational training programs demonstrated their value to the industries that it seems to be taken for granted that women shall receive preliminary school training before their initial induction into the job at the factory.

The training of girls and women for wartime industries challenges the ingenuity of vocational teachers and the ability of administrators to provide suitable facilities and to develop appropriate training techniques. Schools, like many industries, were not organized for the training of women. It is the purpose of this article to discuss the modifications that must be made in any vocational program as well as in its

*Director, Department of Vocational Education, Detroit, Mich.



Inspection and testing will be performed largely by women. Highly specialized testing techniques are quickly mastered by them.

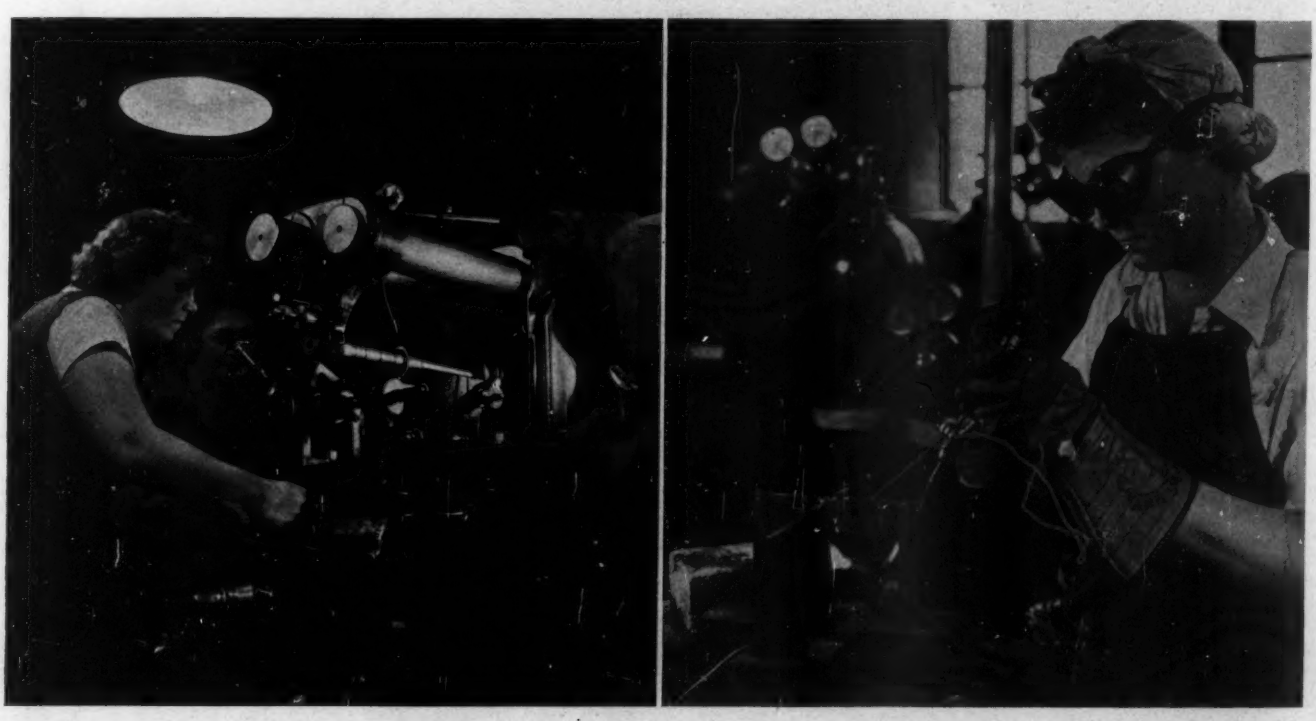
Women make efficient aircraft riveters

physical equipment in order to train women properly for effective war job performance. An opinion poll of vocational school administrators, factory personnel men, and women themselves, reveals that many believe that girls and women should be trained in about the same manner as men. There are others who believe with equal enthusiasm that methods in training women are markedly different. It is clearly the responsibility of the vocational educators to separate as far as possible those notions or concepts which are based mostly on prejudices from those based on facts proved by experience, in areas where we have had little guidance except good common sense. To assume that girls and women can be trained with exactly the same methods and with the same equipment as men is just as extremely unsound as to assume the necessity of a radical disturbance of the established vocational program.

The best training programs will be devised by the vocational teachers who examine most carefully the actual conditions in industry, discovering what prejudices must be overcome, and what adjustments a woman must make in order to succeed on the job.

In What Jobs Will Girls and Women Be Employed?

The urgent need to mobilize all possible sources of labor to replace the large number of young men facing induction into the armed forces has been publicized everywhere. One obvious source of supply is from the ranks of women since the reservoir of trainable workers available from the Works Program Administration and the United States Employment Service has been exhausted. So far as recruitment is concerned it would appear that women are assigned to War Workers' Training Classes in the same manner as men. There are preemployment classes for those not formerly employed, and conversion or upgrading classes for women now employed. Under present regulations the teachers will continue to be men because only men with previous industrial experiences can qualify.



The machine shop has its full quota of women trainees. Note dress well adapted to safety requirements of the job. Safety practices in welding peculiar to women workers are pictorially emphasized in the right-hand illustration

Vocational schools can well anticipate providing workers in many industries and services not directly engaged in the manufacture of munitions. For example, the Michigan Bell Telephone Company has transferred several of its secretaries and clerks from its offices to the maintenance and construction departments. Here the girls are receiving instruction in blueprint reading, tracing, and drafting in anticipation of filling positions vacated by the young men entering the armed services. In Cass Technical High School several girls majoring in commercial art and music are taking drafting during their senior year on the promise of employment from one of the local public utility organizations.

Workers for essential community service will also be drawn from the ranks of girls and women. For this reason special attention should be given to encouraging girls to enroll in day trade classes in occupational areas where girls have not been trained formerly. Recent bulletins from the United States War Training Office permit 17½-year-old boys and girls to enter war-training classes, supplementary to their regular high school work. However, because the age restriction will limit the number of enrollees, the day school must provide the instruction, if there is to be volume training of girls.

Normally, women are not a mobile labor group; hence, they must be trained locally for local jobs. Although it has been demonstrated quite conclusively that no job can be definitely classified as unsuitable for girls and women, vocational schools can be guided by the degree to which women have been employed or by the current requests for training from community industries. Thus schools can minimize the danger of training in an occupational area in which women will have difficulty in obtaining employment.

Recognizing, that, in the main, women must be trained locally for local jobs, one community cannot determine specifically its program by studying what some other community is doing. However, the general trends may be interpreted in the light of the given local situation.

No one is in a more strategic position to study trends over the nation than L. S. Hawkins, Director, Vocational Training for War Production Workers, U. S. Office of Education. His statement follows:

During the month of July, 1942, women constituted 29.8 per cent of all new trainees in war-production training classes. In August, 1941, the corresponding figure was 3.1 per cent. In July, 1942, 8.8 per cent of new enrollees in supplemental classes were women. In August, 1941, six tenths of one per cent were women. Aviation, machine shop, shipbuilding, and radio were the fields in which the largest number of women received training.

Many women are being trained as civilian workers for the armed forces. This training is done for air bases, for air depots, for navy yards, for the Signal Corps, and for the Ordnance Department. Trainees who have passed the preliminary civil service examination are paid while receiving training.

Aircraft manufacturing will utilize many women

Women are reported as of July, 1942, by New York State as enrolled in the following courses and areas:

Courses	*Enrollment*
Machine shop	2449
Aviation trades	2114
Light assembly	678
Tracing	585
Radio	378
Inspection	232
Power sewing	228
Shop mathematics	164
Welding	89
Industrial chemistry	80
Foremanship	71
Foundry	48
Sheet metal	38
Blueprint reading and drafting	23
Electricity	14
Lens grinding	11
Theory of metals	7
Shipbuilding	2

In contrast, the figures from Detroit would show considerable variation in areas emphasized. War-training courses in Detroit report from 60 to 85 per cent women enrolled in various occupational areas. The enrollment as of September 30 is as follows:

Courses	*Enrollment*
Machine shop	976
Aircraft manufacturing	592
Aircraft maintenance	8
Welding	39
Inspection and testing	227
Machine shop	122
Aircraft manufacturing	52
Aircraft maintenance	
Welding	3
Shop mathematics	12
Blueprint reading	196
Inspection and testing	111
Electricity	
Tracer IV	

The Selection and Placement of Women Workers

Employers are constantly attempting to improve their employee selection techniques. They will attempt to place the new worker on the job for which she is best adapted. C. R. Dooley, Director, Training Within Industry, states in regard to the selection and placement of women workers as follows:

All women will not, of course, make productive factory employees. The selection procedure should include particular attention to the background brought to the job — education, training and aptitudes. The housewife who is untrained and perhaps free for only part-time work may move into civilian production and service operations, releasing for full-time war-production employment, women who have had regular work experience.

A common opinion is, "Women have no mechanical ability." It is more accurate to say that they have little "mechanical familiarity." Women are not accustomed to working with wrenches and drills, but the lowered level at which training begins also means an opportunity to begin training with correct procedures — they do not bring "picked-up" bad habits to the job.

Well-planned training for women who have been selected and placed according to good standards will provide a large, productive new

force and give perfectly satisfactory results in every respect.

In referring to British experience he states that women are working successfully on these jobs: assembly, band sawing, boring, crane operation, drilling, grinding, inspecting, lathe work (including the use of calipers and micrometers), optical grinding and polishing, press operating, riveting, turning, welding.

Admittance to training classes should be based upon the most efficient system of selection that can be devised. Industry knows well that not all women will make productive industrial workers; therefore, the school should develop effective methods of trainee selection in order to eliminate the waste involved in misplaced instruction, as well as to avoid an unwholesome effect upon the individual who may fail.

Incidentally, it is apropos to emphasize here that many of the procedures being set up for the training, hiring, and induction of women into industry are the same procedures that would have greatly improved the training and employment of men.

Girls in our regular high schools and in our trade schools should be encouraged to take training for industrial placement, but at the same time any emotional appeal for mass registration in such courses should be tempered with a carefully developed system of testing candidates for training classes. Again, the school must assume responsibility for selecting girls and carrying them through to eventual placement in industry.

Basic Assumptions in the Training of Women for Industry

If we assume that the schools can make an important contribution to the training of women for industry, as they have made a major contribution in the training of men, may we conclude then that the training we have been giving men can, in the main, be given also to the women?

The answer is emphatically in the affirmative.

Based on my personal observations, and on the experiences reported by several industrial personnel men, I am convinced that women can be trained with the same equipment, at the same work stations, by the same teachers, from the same course outlines and texts as the men.

Admitting women's apparent lack of "mechanical familiarity" they have demonstrated remarkable adaptability to mechanical training and have in many work situations developed more manual dexterity than men. It may be that the "American Way of Life" makes us more highly sensitive to the health and safety of women than to that of men. I can find no evidence that "foremanship" over women involves many special production problems. However, there is evidence that *society*, even under the stress of war, is going to continue its protective attitude toward the health and safety of women in industry. Again, it must be freely admitted that our industrial civilization would be improved if a similar attitude of health and safety were developed with respect to both male and female workers.

Training in safety practices may be considered as the first need in the program for training girls and women. From the point of view of the vocational teacher this indicates that special preparation of lessons in safety is necessary at once.

Many states have laws designed to protect the health and safety of women workers. The vocational teacher will need to familiarize himself with these laws. Most industries will require a physical examination before placing a woman on the job. Therefore, a physical examination should be provided before training is begun.

Underlying this assumption is the traditional conception of woman's place in American society. When the war ends, the return of women to their normal peacetime status is probable. The likelihood that a great number of women will remain in industry following the establishment of peace appears remote. The implication of this basic principle for the industrial safety and physical well-being of women employed in war production will be apparent. It is that the health of women must be safeguarded in order that they may resume their normal role in American life in as good physical and mental condition as possible.

Health and Safety Education for Women Workers

A considerable amount of literature has been released within the past few months on the general subject of health and safety for women workers. The October issue of the *National Safety News* carries a rather comprehensive article under the title, "Women at War." The National Safety Council announces the publication of a bulletin "Safe Practices — Women in Industry," number 107. "Safety Clothing for Women in Industry" is a twelve-page pamphlet published by the Women's Bureau, U. S. Department of Labor as special bulletin No. 3. The U. S. Office of Education has released a ten-page duplicated bulletin "Training Women Defense Workers" by Louise Moore, Agent, Trade and Industrial Education.

Among the problems of industrial safety for women workers the selection of proper clothing leads in importance. One reason may be that the ordinary clothing worn by women requires far more adjustment to meet the demands of safety in industry. Vocational teachers will find it necessary to make a careful analysis of the type of clothing to be worn by women, if their health and safety is to be properly protected. Among the recommendations made to women workers is one that pertains to the wearing of gloves. Hand coverings can prevent skin infection and other injuries. Women are advised to keep their hair covered with a bandanna, cap, or hair net. It is also called to their attention that short hair is practical.

For dress, slacks or overalls are strongly urged for women in many industries. Considerable thought should be given to the shoes. If the job is such that there is any danger of dropping heavy pieces on the toes, a shoe with a strong toecap, perhaps reinforced with steel, should be worn. Heels should be large and straight, and worn as low as the habit of the wearer will permit. Agreement is universal that no jewelry should be worn. Women should be encouraged to wear goggles, and compelled to do so when working on grinding or chipping operations. It will require a great deal of tact on the part of the vocational teacher to develop in women a good attitude toward proper dress for women workers.

Anticipating Trends

Any attempt to predict the place of women and girls in the industrial organization of tomorrow would be only a guess. The employment of women in our war industries is increasing, and some authorities predict that 60 per cent of the workers will be women. Vocational educators are meeting the training needs of this new army of workers with the present facilities. Vocational educators should, however, analyze carefully the nature of the training used in placing this army of women on the war-production jobs and contrast it with what may be conceived as the training needs for the workers of tomorrow, whether they be women or men or both.

Women workers in today's industries have prepared themselves principally for the *single skill pay-roll jobs*. Undoubtedly we may expect these women to retain their jobs in the peacetime industries to follow, so far as their particular skills are adaptable to the postwar period. These women will create no particular training problem. In competition with the men returning from military service, one would hardly predict that additional women will be hired.

Vocational educators, however, will have very little influence one way or the other on the employment of women in the postwar period. There is one thing quite evident; there will be neither more nor fewer jobs as a result of using women in the trade and industrial pursuits. Neither will it change the character of the jobs, nor will it change the skills required to hold the job. We have learned through the experience with our war workers' program that women can be trained with the same facility as men for the same jobs. Therefore, may we not assume that the development and organization of vocational schools and classes will be very little affected by women workers.

A New Type Vocational School

ARTHUR B. MAYS*

Since the bitter controversies of the late 1850's and the early years of the following decade, during which time Congress and the educational leaders were debating the "Land-Grant College" bills, there has been a growing interest in vocational education. The establishment of colleges where youth could learn agriculture, the mechanic arts, and, later, homemaking arts gave to the popular mind a new concept of schools. Schools of secondary and higher levels through the ages before had been places where the intellectually gifted and the economically privileged studied the mysteries locked up in books. Now schools were places where one could learn also to do better the daily work by which men sustain life and perform the work of the world. This new idea of school was revolutionary and opened the way for the remarkable progress which both vocational and general education have made since 1862.

The next great impetus to the growth of vocational education, outside the "learned professions," was given by the law popularly known as the "Smith-Hughes" law. It established a new principle of federal aid to education and served to emphasize in the secondary school the same new meaning that the "Morrill Act" of 1862 gave to college education. Both acts were war measures, brought to birth by the strain and stimulation always produced by great wars. Both, however, were the culmination of long-felt needs and of persistent efforts of leaders which long antidated the outbreak of war. Hence, both were basic educational reforms and not mere emergency devices of temporary significance only. The results of both acts in the years of peace following the wars which produced them have been incalculable.

Vocational education at both college and high school levels has experienced remarkable growth during the past quarter century. From 1918 to 1941 enrollments in federally aided classes in vocational education of less than college grade increased from 164,186 to 2,434,641. During that same period expenditures of public funds for instruction in agricultural education increased from $739,933 to $17,602,252; for industrial education from $1,536,438 to $21,927,383; for home economics education from $334,548 to $12,610,127; and from 1938 to 1941 for distributive education, from $643,030 to $1,328,442. For the training of vocational teachers from 1918 to 1941 the growth in expenditures was from $428,140 to $4,507,219. These figures indicate one of the most remarkable educational developments in the history of education, yet the war emergency has demonstrated that the present program of vocational education falls far below the needs of the nation. Thousands of youth are denied the opportunity to obtain adequate vocational education merely because they were born in certain communities and in certain homes rather than in some others. Large sections of the nation are unable to provide needed facilities for vocational education because no town, city, township, or community in them is financially able to support adequate vocational education.

There seem to be but two reasonable solutions of this gross inequality of opportunities, namely, (1) the Federal Government can provide all or nearly all the necessary funds for vocational education, and (2) areas larger than towns, townships, or counties can be organized for the purpose of establishing and supporting adequate vocational school facilities. The first of these remedies runs counter to historic American convictions concerning the control of education, the family, the church, the peoples courts, and local government. Besides it tends to destroy local interest, initiative, and sense of responsibility. The second remedy conserves all of the traditional values of local control of basic social institutions and yet solves a modern problem by modern means. It provides adequate vocational-education facilities for areas of the country which are wholly or almost without any such facilities. By broadening the taxable area for a specialized type of education, many communities can be served and the principle of local control be retained.

What is the character of an area vocational school? In essence there is little that is new in the idea of an area school, for in a very real sense a state university is an area vocational school serving an area coextensive with the boundaries of a state. Likewise some of the large trade schools in our industrial cities are area vocational schools, serving a whole city. An area vocational school, then, is a vocational school designed to serve a whole county, or a group of counties, or a distinctive area or section of country which might even include small parts of two or three adjoining states. If every high school in the land could provide fully adequate facilities for the vocational education of the youth and adults of the communities they serve, there would be no need for area vocational schools. Since all high schools manifestly cannot provide such services, a special school serving larger areas than those supporting the local high schools is needed. The area for which the special school is designed must be determined by such consideration as the economic and social character of the population, its density, its economic and occupational trends, the highway and transportation facilities, taxable values, occupational outlets, and the trends of population migrations.

These schools may be built at a centrally located place in the service area or they may be distinct departments of established high schools which are so located with reference to the area served. It is probable that the easiest and wisest manner of establishing area vocational schools throughout the nation is to make most of them divisions of established schools. In any case, however, they must be directed by a specially qualified head and instructional staff who are answerable to a school board which is representative of the whole area and not merely of the local community in which the school is located. Likewise, the support of the area school, whether it be a division of a local high school or a separately housed institution, must come, in part, from the whole area it serves, in part from the state, and in part from the Federal Government. It is probable that the scheme of support which has been established under the Smith-Hughes law will be the most satisfactory, except that some aid must be given the area in meeting building and equipment needs.

Such area vocational schools to succeed in serving their purpose must operate in close cooperation with all other public schools within the area. The transfer of pupils to and from area schools must be carefully supervised cooperatively by both schools involved. Careful selection, guidance, and placement of students, of necessity, must be a vital function of all area vocational schools. Regular and frequent occupational surveys of the service area and frequent gathering of other pertinent data must also, of necessity, be a part of the routine work of these schools. Close relationships with business and industrial employers, with farmers and housewives, must be maintained by the school in order to meet the real training needs of the area.

There are many problems of legislation, administration, and relationships to be solved before area vocational schools can be universally available to the citizens of every section of the Nation. Such schools, however, are much in the thoughts of vocational-education leaders today as a probable and significant postwar develop-

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ment in vocational education. The need is evident and the war-production classes which serve large areas have given impetus and direction to the thinking of many educators concerning this need. There will be some opposition and many inherent obstacles to overcome. But now is the time for all who are interested in making the program of vocational education in the United States really democratic — providing equality of opportunity to all — to think about, freely discuss, and, if convinced of its value, work for the early establishment of area vocational schools throughout the nation.

Construction of a Distributive Education Curriculum Based on a Job Analysis

MURRAY BANKS*

An activity analysis supplies the curriculum maker with the information he needs to determine the subjects to be taught, and the relative amount of time that should be allotted to each.

A survey of the duties performed by salespeople aids in setting up a more balanced curriculum, containing all the courses needed to equip a well-trained salesperson. It aids more scientifically in determining the correct allotment of time to each course, and it serves as a basis for emphasis in the various topics and courses, and the elimination of some subjects whose worth could not be demonstrated, and the inclusion of others that possibly had been overlooked or considered nonessential.

This article will discuss the steps which were followed in constructing a curriculum in distributive education, based on a job analysis for the Millville, N. J., high school. A study of the method used should be of aid to those who are responsible for the construction of vocational curriculums, and cooperative part-time programs of distributive education.

Developing the Course of Study

"The ideal course should teach the student to 'do better those desirable activities that he will do anyway.' In the preparation of courses of study, therefore, actual desires and activities of students should be given first consideration and the beliefs of educational theorists should be secondary."[1]

"When we have selected out of activity analysis the subject matter of business education, we have next to organize the subject matter in a way that will serve the purposes of teaching."[2]

"As Charters warns us, 'The philosopher sets up the aim, and the analyst provides only the technique for working the aim down into the terms of the curriculum.' To put it differently, activity analysis is a method for securing *data*, which may be used by the philosopher for constructing an educational program or else may be used for realizing objectives that have already been selected; it is not a method for determining what our program is to be. A general in command of an army needs to secure all the information he can about the enemy, but securing this information is not equivalent to constructing a plan of campaign."[3]

Curriculum and Course of Study Differentiated

A curriculum and a course of study must be differentiated. A course of study is a group of selected topics centered around a major interest. It is synonymous with *subject*. Business law, for example, is a course of study. A curriculum is a series of courses which the student is to take in order to attain a high standard of education in the broadest sense of the word. A curriculum is often adapted to a more or less specific level of vocational efficiency. Naturally, the first step in selecting subject matter is to determine the educational efficiency that is to serve as the curricular goal.

"The selection of subject matter involves at least two processes: (1) the selection of subject matter for individual courses, and (2) the development of a curriculum out of a series of courses. In most respects, curriculum construction is only an extension of course making."[4]

Selection and Organization of Subject Matter

In order that learning may take place with the greatest possible efficiency, it is necessary to organize the material that goes into a course into usable teaching units.

A suggested procedure that might be employed in the process of selection and organization follows:[5]

1. On the basis of frequency, an arbitrary selection should be made of a portion of the material collected. This portion or sample should give some indication of the amount of material that could reasonably be taught within the time available for the course. Perhaps the selection might be limited to the first 10 or 20 per cent of the data collected.
2. A differentiation must then be made from the point of view of the materials which are teachable in school, and those which are better learned in life situations. In making this distinction, the course maker may be guided by experimental studies, teachers' judgments, opinions of authorities and of graduates who have taken the subject, and by carefully analyzing and evaluating the arguments which have been advanced for and against teaching the material in school, or permitting the learning to take place in life situations.
3. In order to distribute properly the time allotment in the course, the materials should be differentiated on the basis of ease or difficulty of learning. In the event of a surplus of subject matter this division provides a basis for curtailment. Although the entire problem may be complicated by the maturity of the learner, since this course is devised for the high school senior, this difficulty is greatly minimized.
4. After the data has been evaluated, the material should be tabulated in order to form a work sheet. The work sheet thus serves as a unified source from which the data may be placed in various categories for teaching purposes. (The four steps thus far given are frequently included in the scope of the job analysis.)
5. The course maker must now select the activities that are to be included in the course. Although this must necessarily be a subjective process, a system may be arbitrarily set up to aid in evaluating the various factors involved. The course

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[1]Herbert A. Tonne, *Business Education: Basic Principles and Trends* (New York: Gregg Publishing Company, 1939), p. 137.

[2]Paul S. Lomax, *Commercial Teaching Problems* (New York: Prentice-Hall, 1928), p. 74.

[3]B. S. Bode, *Modern Educational Theories* (New York: The MacMillan Company, 1927), p. 108.

[4]Herbert A. Tonne, *op. cit.*, pp. 137–138.

[5]Adapted from Paul S. Lomax, *op. cit.*, p. 85.

maker should seek expert opinion in addition to any system of arbitrary evaluation which he may set up.

6. It is generally agreed that in order for traits to be learned successfully, the learner must perform the activities in situations which are lifelike. At this point, therefore, it is necessary to organize into lifelike situations the activities that are to be taught.
7. The level or performance which the worker must attain should be determined. Is it desirable that complete mastery be attained, or is acquaintance sufficient? In determining the teaching emphasis, the opinions of experienced workers or apprentices should be secured.
8. Include the information necessary for an understanding of the course. For example, to understand the work of the clerks in the advertising department, it is necessary to have an understanding of layout, copy, proofs, etc., even though the knowledge is not directly needed by such clerks. The allied courses that are desirable for the student to take in order to secure promotional opportunities should be listed.
9. Effective teaching methods, testing processes, and remedial procedures to be employed should be determined.
10. The problem of effective guidance enters at this point. Requirements and standards for admission to the course should be established. Thus, students who are best fitted to successfully complete the course and be absorbed by industry are selected for admission to the course.
11. Finally, the course is applied in the actual classroom. Textbooks and teaching aids are selected. By a process of trial and error, faults not hitherto noticed are observed and eradicated.

It is, of course, not essential for the course maker to follow the steps mentioned in order, nor to include them all. The process may be curtailed or amplified as the case may require. The adherence to any one given technique is not as important as the adherence to some organized plan of procedure.

Steps in Constructing the Curriculum Based on Job Analysis

Determination of the General Objectives

The raw data were the activity analyses obtained from studying the activities of 78 salespeople. As soon as an attempt was made to summarize all this material, it was most apparent that a general objective for the entire retail selling curriculum must be stated, otherwise it would be impossible to decide which activities to include and which to exclude.

The following general objectives were adopted:

1. That the aim of the retail selling curriculum at the Millville High School should be the training of boys and girls to become salespeople and distributive workers.
2. That the curriculum must include instruction in the phases of retail work which they were called upon to perform in their daily routine in local stores.
3. That instruction in retail salesmanship, advertising, arithmetic, spelling, and personal development should be given, and that such instruction should be closely related to the instruction in store practice.
4. That instruction be given to aid the trainees to appraise correctly people with whom they have business relations, including buyers, employers, employer representatives, fellow salespeople, and employees who are subordinate to them.

Grouping of Job Duties

It was determined that the content of the subjects to be developed should be determined, as far as possible, by the job analysis data. All items in the duty analysis were accordingly assigned to the somewhat arbitrarily selected course headings as follows:

1. Retail salesmanship.
2. Retail principles and practices.
3. Psychology of human relations.
4. Conference on store practice and job problems.
5. Merchandise information.

The problem of determining the type of knowledge employed in performing different duties was solved empirically. While collecting the data, the job analyst constantly asked himself, "What ought to be taught in order to fit youth to perform this or that duty?" For example, a salesperson in an upholstery department is frequently called upon to explain the details of a custom made set of slip covers which the customer wishes to purchase. For a salesperson to perform this apparently simple duty, it is necessary for him (1) to have some training in *English* so that he can explain in an understandable way just what can be done. Quite obviously, this is not the type of English that usually is taught in a high school course. As he talks to the customer he should know (2) *some of the technique of handling people.* Familiarity with (3) *merchandising processes and shop methods* is a valuable asset in determining the length of time required to do a job, the cost, and the appearance of the finished work. The salesperson who thus meets customers should know (4) *how to estimate.* Whether or not an order is placed may depend upon this factor alone. He should know something of (5) *drawing and freehand sketching* so that he may illustrate what he says and to "sell his ideas" concerning design to the customer. (6) *Mathematics* is necessary so as to figure sizes and yardage required and the cost of the finished work. Frequently when large orders are placed or when several unusual specifications are stated, a contract is drawn up and signed. Here some knowledge of (7) *law and contracts* is of value. The salesperson should know something of (8) *colors, and combining designs and styles* so as to place that information at the disposal of the customer. Finally, a knowledge of the principles of (9) *advertising* and (10) *selling* contribute to the success of the salesperson who hopes to dispose of his product.

The complexity of the average salesperson's job is not realized until it is analyzed in this way. Then the problem of building a curriculum to train salespeople and distributive workers assumes gigantic proportions.

Weighting the Items

The data secured was evaluated so that emphasis might be placed on those duties which were performed with the greatest frequency, and those which were regarded as the most difficult to learn to perform. Those materials that are hard and easy to learn should be differentiated. Such information is needed in order to distribute the time allocated to the course and to provide a basis of curtailment in case of a surplus of subject matter.

Determination of the Objectives for the Course of Study

Tabulation of the material then followed, in order to form a work sheet. The latter serves as a unified source from which the data may be placed in various categories for teaching purposes.

"Just as in job analysis we proceed from the vague to definite ideas, so in curriculum construction we tend to progress from the general toward the specific."[9]

In writing the curriculum for the retail selling program, no attempt was made to set course names and crystallize material around those names. Instead, the five course names, already mentioned, were tentatively determined upon, the material was grouped and regrouped until a satisfactory arrangement was evolved, and finally the courses were named. By this means the course names were determined by the contents and not vice versa.

As the total scope of each course thus developed out of a study of all the elements gathered together from the duty analysis, the objective or aim of the course also emerged.

Determination of the Curriculum As a Whole

The final retail selling curriculum was drawn up in terms of the courses of instruction which had developed out of the job analysis, and had been drawn up finally to meet the objectives which had been adopted for the program.

[9]E. K. Strong and R. S. Uhrbrock, *Job Analysis and the Curriculum* (Baltimore: Williams and Wilkins Company, 1923), p. 77.

Vocational education must keep abreast of today's work developments at least, leading the way whenever it can be seen or anticipated with reasonable certainty.

—The Michigan Program for Vocational Education

Visual Aids Quicken the Learning*

RALPH W. WHALIN**

The individual who understands how learning takes place recognizes the importance of the sense of sight to the learning process. The learning situation which brings into play the greatest number of senses is likely to be the most effective. We tend to learn more through the sense of sight than through any of the other senses. The student who hears a particular mechanism explained, sees how it operates, and then actually operates it, is participating actively in a situation favorable to economical learning. Visual aids enable the instructor to make excellent use of the important sense of sight in many and varying learning situations. The Armored Force School, through especial encouragement of Brigadier General S. G. HENRY, has long used instructional aids as major teaching devices. The aim here is to present the characteristics and uses of good visual aids.

What Is a Visual Aid?

A visual aid is any especially prepared device designed to facilitate learning through the sense of sight. It is usually of such a nature and size that it can be used in carrying on group instruction, being large enough to be visible to the class. Text materials, reference books, and other printed matter make use of the visual sense, but since these are not considered as being especially prepared devices that can be used before an entire class, they are not considered here.

For What Purpose Are Visual Aids Used?

Visual aids usually are not considered as methods or techniques of teaching, but as devices that can be employed effectively while presenting instruction by any of the recognized methods. Among the important uses of visual aids are the following:

a) They increase the visual experiences of the student. This type of teaching device provides the learner with additional experiences and increases his knowledge of the subject.

b) They strengthen vital images. Important sensory impressions involved in learning will become stronger.

c) They give experiences not possible in the shop or classroom. Through the use of films, models, charts, and maps, the student may acquire information that otherwise would be impossible. Tactical situations may often be presented in the classroom through the use of films or sand tables before the students are actually confronted with them in the field.

d) They add variety to student activities. The use of visual aids assists the instructor in developing interest and eliminating monotony in the classroom.

e) They re-enforce learning. Instructional units already taught may be re-enforced through the use of visual aids.

f) They develop interest in some specific subject or activity. A film, slide, model, or chart may be used to arouse interest in a subject and get the students in a state of readiness to learn.

g) They develop an understanding of a subject in the shortest possible time. The time necessary for students to learn a subject may be decreased by supplementing other methods with effective visual aids.

h) They assist the slower student in learning. The visual aid can remain before the student or may be referred to until he has mastered the subjects. A technical principle that is difficult to understand with only oral instruction may be clarified.

i) They are aids to other methods of instruction. Visual aids do not usually replace other teaching methods, but should make them more effective. A visual aid should seldom be used as a separate method of instruction.

j) They show relationship between instructional units, lessons, subjects, and other learning activities. Films and other visual aids may be used to tie lessons or subjects together and give them unity. This assists the student to use past experiences in new situations, which is the essence of learning.

What Are the Characteristics of a Good Visual Aid?

In planning, selecting, or evaluating a visual aid, consideration should be given to the factors that make it valuable as a teaching device. The following are characteristics of good visual aids:

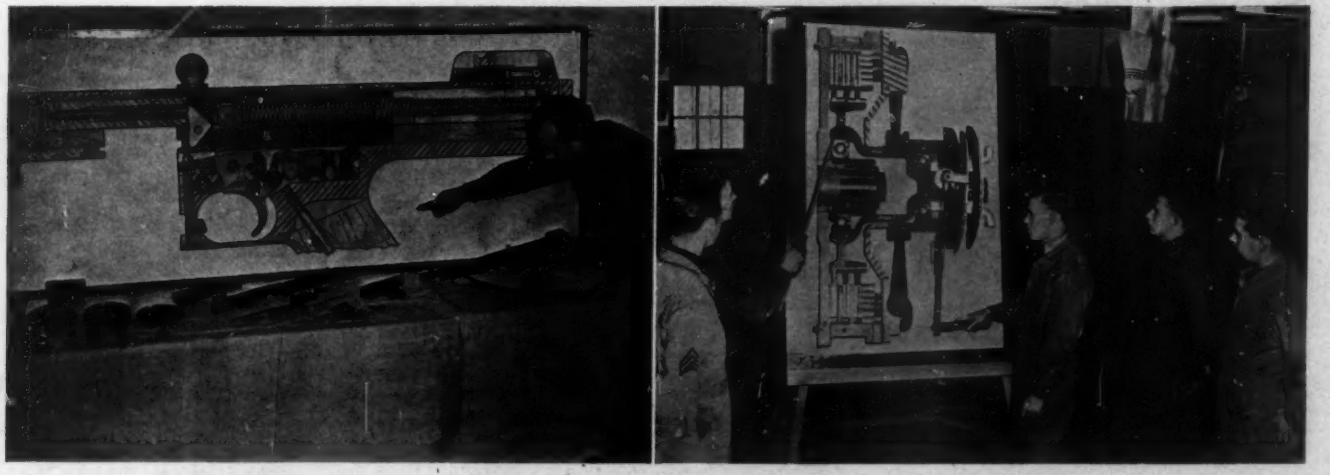
a) The aid should be large enough to be seen by all the class. Every student in the room should be able to see all parts of a visual aid from his location. An aid is of little value if all the students do not see it.

b) The important parts stand out. This is often accomplished by using colors, crosshatching, or shading.

c) Only the essentials are included. All

*This is the fourth of a series of articles on presentation of lessons by staff members of the Teacher Training Department, Armored Force School, Fort Knox, Ky. Brig. Gen. S. G. Henry is the commandant of the school, and Lt. Col. Verne C. Fryklund is director of teacher training. Trade analysis and human relations were taught in the school prior to teaching the content of these articles. The articles will not appear in sequence. Certain details referring to the military have been deleted.

**Teacher Training Department, Armored Force School, Fort Knox, Ky.



Large scale and working models

Cutaway models

unnecessary details are omitted. They are both worthless and confusing.

d) A visual aid is used for some specific instructional purpose. It should not be used to fill in time or to entertain students.

e) All lettering and notes must be clear and unadorned. Use plain letters that can be read from the rear of the room. A visual aid is not the place for elaborate lettering or for decorative work.

f) The vocabulary used in the notes must be within the ability of the student to understand. The things to be taught must not be obscured by words that the average student does not understand.

g) It should be portable, easily moved and transported. An aid may be used for a period of several years. It is often moved from one room to another.

h) It is displayed before the class only when needed. All such devices distract attention if they are shown before there is a need. They should either be covered or removed when not in use.

i) It is made to scale. Models or other aids not in proportion confuse the learner and give him false impressions of an object.

j) It is durable and strongly constructed. All aids must be well constructed in order to withstand constant use in the classroom.

k) It conforms to accepted technical practices in the field. All technical instruction must keep pace with developments in the field. The efficient teacher keeps abreast of the technical improvements in his subject and is familiar with effective instructional techniques and devices.

When Should Visual Aids Be Used?

A visual aid should be used only when it will assist the teacher in presenting a lesson. If the aid is displayed before needed, the students are likely to concentrate their attention on the chart, model, or diagram rather than upon what the teacher is saying or doing. The aid should remain covered or out of view of the class until the stage is reached in the lesson where it will clarify certain points being taught by the teacher.

What Types of Visual Aids Are Available?

Blackboard Illustrations: The blackboard is used daily by the resourceful and skilled teacher. Example of items that may be placed on the board are developmental topics or questions, sketches, charts, maps, graphs, diagrams, or directions. Students may also place their work on the board for evaluation and criticism.

Models: A model is a replica of some object. It may be in miniature; it may be in exact size; or it may be enlarged. Most of the numerous types of models can be classified under the following general headings: actual size models, smaller scale models, large scale models, nonworking models, working models, transparent models, cutaway or section models.

Excellent cutaway and section models are used in the shop or classroom to show the function of some part that is otherwise obscured. The use of such devices permits the teaching of functions and principles in the shortest possible time.

Enlarged models are often made of some working part to explain complex mechanisms that may be difficult of understanding. Small scale models are used to illustrate the working or characteristics of large objects. Both enlarged and small scale models have more instructional value when constructed so that the parts actually work. Nonworking models of planes, tanks, and vehicles will have many uses in the type of instruction carried on in the Armored Force School. They are indispensable for identification purposes and for setting up examples of situations that the student is to deal with.

Charts: Charts are used to draw the attention of the class to important facts or ideas. Excellent charts can be made showing such things as functions of working parts, the care and servicing of equipment, and the outlining of an organization. Charts must be large enough to be seen from all parts of the room and clearly illustrated so that few words of explanation are necessary. Arrange the charts in such a manner that they may be displayed when needed, and then removed without distracting attention. It is advisable to mount them on rollers or slides. When not in use, cover them if they are left in front of the class.

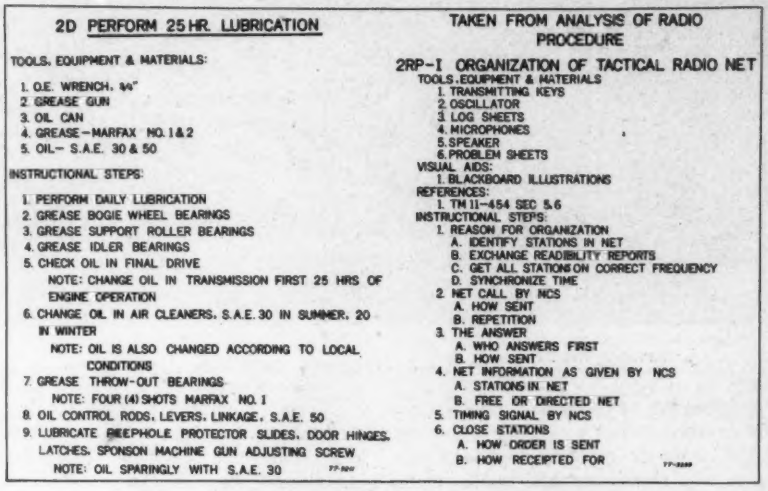
Bulletin Board: A well-kept bulletin board can be a helpful teaching device. Interesting and important material dealing with the instructional units being taught should be kept posted. One individual may be given the responsibility of keeping the bulletin board up to date. All types of printed, pictorial, and graphic materials may be displayed. A place should be reserved for official announcements and bulletins. The bulletin board that is kept up to date will attract the students' attention. The material displayed should be changed periodically. Such a procedure tends to keep interest alive.

Sand Tables: Sand tables may be used to great advantage in instruction involving tactical problems. The sand may be shaped to resemble any form of terrain. The landscaping can be done to scale and made very realistic. The objects which make up a part of the landscape are often in natural colors. Miles of terrain can be reduced to a small scale and represented on a sand table. A tactical problem may be set up with miniature arms and equipment for the student to study before being confronted with the actual situation in the field.

Exhibits: Exhibits of models, samples of work, and damaged parts of equipment make strong impressions upon the indi-

vidual. The student will retain, for a long time, an image of a damaged tool that has been abused by improper use and carelessness. Such displays are effective teaching aids.

Film Strips: A film strip is a length of standard motion picture film containing still pictures or instruction on some subject. It is shown on the screen as a still picture. Each strip generally deals with a particular subject or learning unit. The steps in performing an operation are often shown. Each step is arranged in the proper sequence and can be shown on the screen as long as is necessary.


2D PERFORM 25 HR. LUBRICATION
TOOLS, EQUIPMENT & MATERIALS:
1. O.E. WRENCH, 44"
2. GREASE GUN
3. OIL CAN
4. GREASE—MARFAX NO. 1 & 2
5. OIL— S.A.E. 30 & 50
INSTRUCTIONAL STEPS:
1. PERFORM DAILY LUBRICATION
2. GREASE BOGIE WHEEL BEARINGS
3. GREASE SUPPORT ROLLER BEARINGS
4. GREASE IDLER BEARINGS
5. CHECK OIL IN FINAL DRIVE
NOTE: CHANGE OIL IN TRANSMISSION FIRST 25 HRS OF ENGINE OPERATION
6. CHANGE OIL IN AIR CLEANERS. S.A.E. 30 IN SUMMER, 20 IN WINTER
NOTE: OIL IS ALSO CHANGED ACCORDING TO LOCAL CONDITIONS
7. GREASE THROW-OUT BEARINGS
NOTE: FOUR (4) SHOTS MARFAX NO. 1
8. OIL CONTROL RODS, LEVERS, LINKAGE, S.A.E. 50
9. LUBRICATE PEEPHOLE PROTECTOR SLIDES, DOOR HINGES, LATCHES, SPONSON MACHINE GUN ADJUSTING SCREW
NOTE: OIL SPARINGLY WITH S.A.E. 30
TAKEN FROM ANALYSIS OF RADIO PROCEDURE
2RP-I ORGANIZATION OF TACTICAL RADIO NET
TOOLS, EQUIPMENT & MATERIALS
1. TRANSMITTING KEYS
2. OSCILLATOR
3. LOG SHEETS
4. MICROPHONES
5. SPEAKER
6. PROBLEM SHEETS
VISUAL AIDS:
1. BLACKBOARD ILLUSTRATIONS
REFERENCES:
1. TM 11-454 SEC 5 & 6
INSTRUCTIONAL STEPS:
1. REASON FOR ORGANIZATION
A. IDENTIFY STATIONS IN NET
B. EXCHANGE READIBILITY REPORTS
C. GET ALL STATIONS ON CORRECT FREQUENCY
D. SYNCHRONIZE TIME
2. NET CALL BY NCS
A. HOW SENT
B. REPETITION
3. THE ANSWER
A. WHO ANSWERS FIRST
B. HOW SENT
4. NET INFORMATION AS GIVEN BY NCS
A. STATIONS IN NET
B. FREE OR DIRECTED NET
5. TIMING SIGNAL BY NCS
6. CLOSE STATIONS
A. HOW ORDER IS SENT
B. HOW RECEIPTED FOR

Large charts are helpful in training teachers

Lantern Slides: Lantern slides may be of the transparent or the opaque type. Some are a combination of both. They are used in showing maps, charts, printed matter, photographs, or other illustrative material. If the necessary materials are available, the instructor can make his own slides by using cellophane paper on a typewriter or by making sketches on specially prepared ground glass.

Training Films: Both silent and sound films are used extensively in Army training programs. They are classified as:

a) *Basic*, or those that present factual knowledge of basic subjects of general information such as "Personal Hygiene" and "Military Courtesy."

b) *Mechanical*, or those that explain the mechanical functioning or operating characteristics of weapons, materials, and equipment; to illustrate the organization and equipment of units; and to explain the physical or chemical phenomena of military value.

c) *Technical*, or those that illustrate the use of weapons and equipment or the actions of individuals or a group in performing an operation or series of operations.

d) *Tactical*, or those that illustrate the application of the basic doctrine of combat tactics of the different arms and services.[1]

Sound films utilize two of the important senses in learning. Both types of films intensify interest and call attention to important things to be learned. Sensory impressions become stronger and the student is subjected to important experiences in the learning situation that might otherwise be impossible.

The students should be informed on what to look for before viewing the film. A list of questions may be used to guide them in their observation. They should be tested or a discussion may be held on what they have learned from the picture.

Motion pictures should be used only where they will prove an effective aid to learning, and where they will assist the student in grasping the subject matter being taught at that time. Many useful films and film strips are on file in the training film department of the Armored Force School. They should be used whenever possible.

Where Are Visual Aids Secured?

Many of the best visual aids used in the classroom are made by the teacher or under his direction. There are several advantages in making them. The teacher may prepare just that which he wishes to show in an aid and omit all unimportant or undesirable features. They can be made to the size needed for classroom use.

Visual aids can be secured from a great many sources. The increased emphasis upon the need and value of such aids in learning has greatly enlarged the available supply. Some of these sources are given below. Most of these aids are in the form of films, slides, strip films, charts, maps, and printed matter.

a) Industrial Firms
b) Public Health Service
c) Educational Institutions
d) Department of War
e) Department of Navy
f) Department of Interior
g) Department of Agriculture
h) Department of Commerce
i) Treasury Department

[1] "Military Training," *Basic Field Manual*, FM 21-5 (U. S. Government Printing Office, Washington, D. C., July 16, 1941), pp. 31-37.

In-Service Training for the Industrial-Arts Teacher

V. L. PICKENS*

The education of a real industrial-arts teacher is a continuous process. Specific training begins when he makes the choice of his vocation, and must continue to the end of his service period. Today the job of the industrial-arts teacher is much more difficult to perform than ever before. No longer can he satisfy himself, his pupils, or his patrons by knowledge and skill limited to one area.

Tremendous industrial expansion, the development of new materials, the general use of new machines and "gadgets," the wide and varied interests of the pupils in our schools, the larger classes, and the general shops all combine to eliminate the teacher who lacks initiative and the desire and willingness to explore. In Kansas City, Mo., the desire of the industrial-arts teachers to grow on the job has paid dividends in better morale, more skill, wider knowledge, and what is particularly important, a complete understanding of the specific objectives and work being done by their fellow teachers in other areas and other schools served by the department.

*Director of Practical Arts, Kansas City, Mo.

Training teachers to take over industrial-arts classes for the duration — Willis Wagner and Edgar Jackson, instructors

The Induction of the New Teacher

Few schools allow a new teacher to start cold on a job. Too often, however, the assistance he is given is rather perfunctory and consists of directions for filling out forms, reports, and a gift of the course of study, the inventory, and the door key.

Our teachers have developed a technique calculated to bring the teacher into a new situation with the least possible friction. When he arrives in Kansas City he is met by the other teachers in the department of the school to which he is assigned. They help him find a place to live, if possible, near another industrial-arts teacher of the same age. Those teachers who have gone from a small community to a large city to teach can appreciate the value of this service. These same teachers help him get acquainted in the school; explain all forms, reports, and regulations; and assist him to check the inventory and records left by his predecessor.

During the first week on the job, the new teacher is visited by teachers from other schools who teach in the same type of shop. They answer his questions and, when necessary, give him aid. As an example, a new man assigned to a general metals shop in a junior high found that he did not have the skills necessary to teach one of the units. One of his visitors, a teacher of metals from another school, found this out and volunteered to help him. He gave twenty-three hours of his time after school and on Saturday training this teacher. This type of service is not at all unusual. As you can imagine, the recipient is eager to pass the same type of service on to another in need. This volunteer teaching isn't all given to new teachers. Nearly all our innovations — spinning, jewelry making, stone cutting, weaving,

Class in upholstering for industrial-arts teachers — Ray L. Koenig, instructor

General metals class for teachers — J. R. Manly, instructor

Pottery for the industrial-arts and classroom teachers — Joseph Lukens, instructor

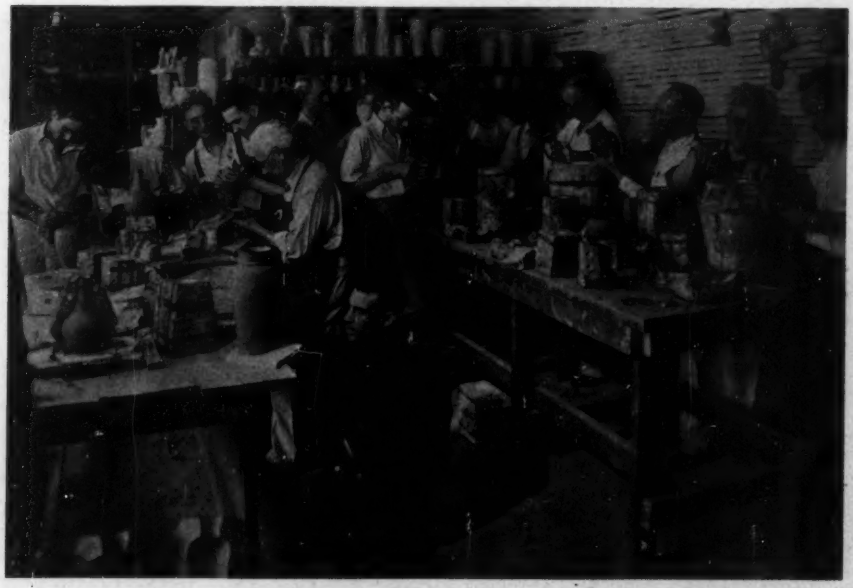
and other crafts — have originated in one shop or another. The instructors have then shared them with their fellow instructors. It is traditional that everyone of the 80 men and women in the department contribute some new technique, project, or method during the school year.

Extension Classes

For the past 10 or 12 years from two to five extension classes have been offered each fall for the men in the department. Each spring at a general meeting, the men fill out blanks stating their desires as to courses for the coming term. No one is required to take a course; no one is barred.

In the past 10 years, the men have requested and have been given classes in philosophy of industrial education, methods, problems, machine shop, sheet metal, art metal, jewelry, stone cutting and polishing, spinning, foundry, welding, wood carving, upholstering, wood and metal finishing, photography, crafts, sketching, design, drafting, pottery, and motor winding. All but the first two, philosophy of industrial education and methods, were taught by teachers in the department. These classes are now attended by principals, classroom teachers, and patrons, as well as industrial-arts teachers, for two hours' credit or not as they choose.

At first these classes were given to improve the skills of specific groups — metals for teachers of metals, woodwork for teachers of cabinetmaking. This has been changed as indicated. A new respect for industrial arts is being built up by serving dozens of teachers and patrons outside the department. One of the more important outcomes of these courses has been the broadening of the men's outlook on the whole field of industrial arts. Today just as many teachers of wood and drafting are to be found in classes of pottery, wood carving, or crafts. It is easy to see how invaluable work in machine, pattern, or sheet-metal shop would be for the teacher of drafting. Out of this overlapping of interests has come a better team spirit than has ever existed before. The men know and respect the work of the other industrial-arts teachers. They know about the materials and processes used in other shops, because they have actually used them. They "talk each other's language."



A course in mold-making for elementary industrial-arts teachers

At this time when there is a great scarcity of industrial-arts teachers we have been able to fill most of the vacancies in our metals shops by using teachers of other subjects who have taken our extension classes.

At a small social gathering recently, a teacher of general woodwork displayed a beautiful silver ring he had made in his home shop and a handful of stones cut and polished on a "lap unit" built in an extension class. A metalworker displayed a tooled billfold he had just completed. A printer told of his rapily expanding home workshop. This same printer, in the past three years, has taken courses in machine shop, welding, upholstery, and pottery. Three years ago one of our teachers of cabinetwork became interested in pottery and did something about it. Today he has classes for high school students and extension classes for our own industrial-arts teachers, principals, and teachers of other academic subjects.

This growing interest in other fields has done much to wipe out all boundaries between the different areas in the department. As a result, woodwork, metals, drafting, crafts, and printing have taken on new life, and the teachers to a man are far more interesting than they were with their narrow horizons.

In-Service Training During the Summer

The department maintains its own employment service and finds jobs for many of the members for summer work. Last summer 21 teachers in the department taught in either colleges, universities, craft schools, or camps.

Each teacher takes to his summer job fresh practical experience which is of incalculable value to summer students. Our teachers return in the fall with new ideas and techniques gleaned from their students and associates from many parts of the country. This is added to the total experience of the department.

The necessity for the development of new courses, the association with new men also teaching in the field of industrial arts, and the experiences gained in an entirely new environment renew their energies and interests to the end that they return in the fall better prepared to discharge their regular teaching duties.

Student and Teacher Demonstrations

Supervisors have always been cast in the role of "Typhoid Mary." They carry the good ideas and new procedures from one shop to another. Supervisors will continue to do this, but there is a better way which perhaps has not been used enough. Departmental and group meetings are held in the various shops — a different one each time. At these meetings the instructor in charge of the shop, or his pupils, give demonstrations in new materials, new processes, or new methods. It is at this time that the instructor can trot out his "newest" — a job plan card, a time card, his new revamped toolroom, his latest method for displaying his project of the week. All his co-workers are looking for new ideas and are making mental notes for improving their own shops.

The teachers use each meeting place as a trading post. They bring their new projects, new jigs, blueprints, and new ideas and give what is asked for and take what they can use.

This technique makes an appeal to the professional pride of each teacher involved. Shop housekeeping improves, methods are examined and when advisable, revamped. Quality of workmanship and design has showed steady gain. The spirit of give and take is much in evidence. Out of these meetings has come new inspiration, new ideas, and new determination to contribute one's own share toward the general improvement of the department.

The men have learned and believe that it is only out of mutual respect, understanding, and pride in what is being done in all the shops, that a real department can be built and maintained to the end that our children are better served.

School-Sponsored Home Workshops

GEO. A. WILLOUGHBY* and DUANE G. CHAMBERLAIN**

The idea of sponsoring home workshops is not new but it deserves much more consideration than it has been given in the past. There is no doubt about the values to be received by pupils encouraged to establish and develop shops at home. Over twenty years ago experiments were tried in stimulating school shopwork by constructing tools and devices that could be used in a home workshop and the results were very gratifying. There was a definite increase in interest in the construction of many shop projects.

For over 10 years we at Michigan State Normal College have set out to definitely promote home workshops through school activities, through home visits, and by calling them to the attention of all pupils enrolled in industrial-arts courses. Our results during this entire period of time have been very encouraging. Our section of the coun-

*Head, Industrial Arts Department, Michigan State Normal College, Ypsilanti, Mich.
**Roosevelt School, Ypsilanti, Mich.

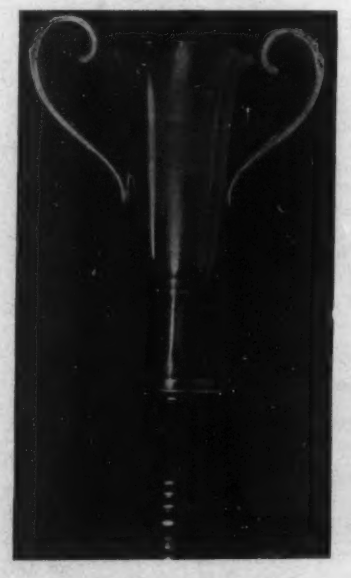


Fig. 1. Home workshop trophy

Fig. 2. A typical home workshop

try is dotted with home shops where in many cases father and son cooperate in making things.

Recently, a study was made to determine what other schools in Michigan are doing in the way of home-shop promotion. This resulted in several interesting findings which are presented together with some of the methods used in our school and some of the advantages of home workshops sponsored by the school. This study reached 192 schools and among the schools reporting a school shop approximately two thirds (67 per cent) indicated that they encouraged pupils to establish home workshops. Several techniques were used to stimulate and encourage the development of these home shops as shown in the following table.

Methods Used to Encourage Home Workshops in 111 Schools

	Home Visitation	*Trophies or Awards*	*Class Discussion*	*Club Activity*	*Home-shop Construction Equipment*
Number of Schools	73	7	83	36	96

Methods Used and Their Extent

Construction of home workshop equipment such as miter boxes, bench hooks, chisel handles, tool panels, and nail boxes in the school shop leads as a method of stimulation. The prominence of this method may be traced to its effectiveness as well as to the ease with which it fits into the school program. A number of teachers expressed faith in a home-shop equipment unit which included both new construction and reconditioning of old tools within the school-shop course of study because of the effective tie-up it created between the school shop and the home shop.

Class discussion relative to home-shop organization received considerable emphasis as a means of stimulation again, doubtless, due to ease of presentation. The lag of this method behind tool construction can be traced to the fact that though frequently utilized by the busy teacher it is a less effective means of promotion.

Home visitation was used by a surprisingly large number of teachers. Most shop teachers recognize the necessity of actual visits to the home shops if they are to give maximum assistance to the boy.

One third of the schools place their home-shop program on a club activity basis, recognizing that through group activity opportunity is provided for demonstration of special home-shop skills and techniques, exchange of ideas on organization, projects, and methods, as well as exercise of leadership on the part of club officers.

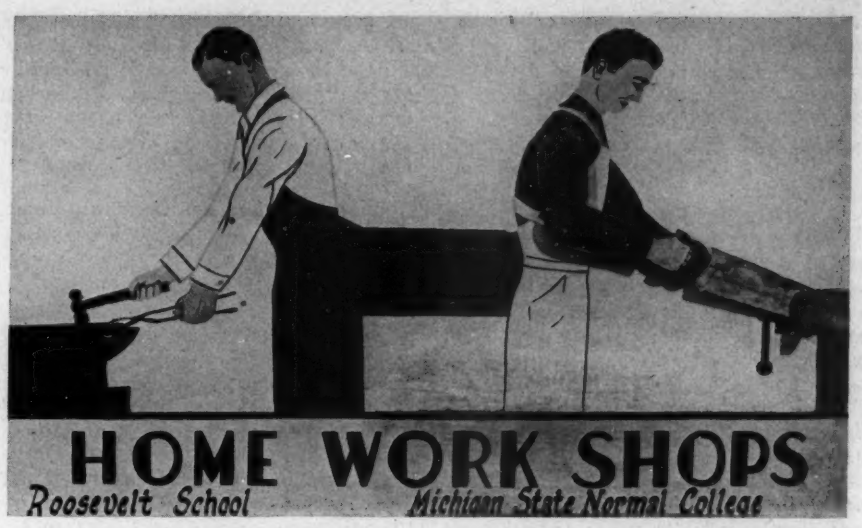


Fig. 3. A motor-driven action display for promoting home workshops

Michigan State Normal College — Roosevelt School

Instructions: Hang this card in your shop.
Record and date each job in proper place when it is done.
Record improvements made in proper place.
Return card signed by parent at close of school year.

Name ..... Age ..... Grade .....
Address .....

Home Shop Record

Types of work	Jobs completed	Date
General repair & maintenance — Glazing, painting, gluing, plumbing, sharpening tools, farm machinery, etc.	1. 2. 3. 4. 5. 6.	
Woodwork — Benchwork, carpentry, turning	1. 2. 3.	
Metalwork — Soldering, tin can work, cold metal	1. 2. 3.	
Model building — Airplanes, boats, etc	1. 2. 3.	
Weaving — Art fibre, rope, cane	1. 2. 1. 2. 1. 2. 1. 2.	

Improvements made in shop — Date

1. 2. 3. 4. 5.

Parent's Signature

Fig. 4. Home-shop report card.
Original 8½ by 11 in.

Trophies and awards were used by few schools. This possibly is due to a tendency to move away from the "award idea" in all phases of school endeavor. A more likely reason can be found in the lack of application of this idea because of the newness of the home-shop movement in schools. It was indicated in some instances that schools should give the same recognition to home-shop and mechanical achievement as to scholastic success or athletic prowess. The presentation of a proper award at a general school assembly gives prestige and increased standing to manual skills which

is helpful in guiding the proper quota of boys toward manipulative occupations and industrial studies.

Figure 1 pictures a silver cup trophy which is awarded each year to a boy in the Roosevelt School of the Michigan State Normal College who has achieved outstanding success in home shopwork.

Several additional devices for the motivation and stimulation of home workshops, which are utilized by teachers in Michigan, are as follows:

1. Home-shop project displays are arranged at school to show the type of work being done and to afford opportunity for the comparison and exchange of ideas.

2. Photographs of home shops made by the shop teacher or members of the home-shop group are found effective in picturing progress and permitting comparisons. Some schools report this activity carried on by a photography club. Figure 2 shows a typical home workshop of one of our boys.

3. Home-shop bulletins suggesting shop "kinks" and projects and containing news items concerning certain progressive home shops are duplicated and distributed among the groups.

4. Some schools direct attention of the pupils to home workshop activities by means of placards, pictures, or promotion devices of various kinds which are prepared by members of the group. Figure 3 illustrates such a promotion device that we have used. It is operated by an electric motor which causes the figures representing the boys, to work.

5. Reports of home-shop activities, ranging from simple written reports to home-shop stories and printed report cards similar to the one shown in Figure 4, were used in a number of schools.

Major Benefits and Values

The number of schools sponsoring home-shop programs reveals that many shop teachers are recognizing educational values of considerable worth in the home-shop idea. Major benefits or values resulting from a school sponsored home-shop program are listed as follows:

1. Home shops give the boy opportunity for direct contribution to his home through repair, maintenance, and construction jobs within his ability. Such contributions on the part of a boy stimulate a healthy interest in his home.

2. Home shops give the boy opportunity to pursue a desirable avocation in the home under trained supervision. It holds the boy at home engaged in desirable manipulative activity and reduces the possibility of participation in undesirable or valueless pursuits.

3. Home shops make possible close cooperation between the school and the home. Through the home shop it is possible for the school to place desirable boy activities in the home and at the same time create legitimate reasons for the teacher to visit pupils' homes. Home calls permit observation of the child's home environment including such factors as standard of living, parent personality, home duties required of the child and the attitude of parents toward school-shop activities.

4. Home shops increase the interest in school-shop activities. Many of the skills and information acquired in the school shop are given immediate and direct application in the home shop.

5. Home shops create a greater respect for tools. Ownership of tools and equipment with the accompanying responsibility of their care, cause them to take on more meaning to a boy and tend to make him sensitive to obvious tool misuses.

6. Home shops encourage orderliness in the care of tools and equipment and give training in shop organization.

7. Home shops assist in the teaching of safety and safe practices emphasized in the school shop.

Teaching Materials for Industrial Education

CHRIS H. GRONEMAN*

The following list of teaching aids was collated to help the teachers of the various departments of industrial arts and vocational education.

Many of the booklets and articles contained in this list have cost those who distribute them quite an appreciable amount of money. It is but courtesy to enclose sufficient postage with your request to cover mailing charges.

It is advisable that teachers use school stationary when writing for any of the items listed. All items are free unless otherwise noted. In most cases a small charge is made when free items are ordered in quantities.

Auto Mechanics

J. I. Case Co., Racine, Wis.
- *Green Fields Reveal New Riches*
- *Faster, Freer Harvest*
- *New Tempo in Tillage*
- *100 Years of Farm Power Progress*
- *The Case Eagle*
- *How to Build Terraces With Case Wheatland Plows*
- *From a Bar of Raw Steel*
- *A Few High Lights in the History of the J. I. Case Co.*
- 10 Golden Anniversary Case Tractors (chart)
- 100 Years for Food and Freedom (chart)
- Lone Light in Antioch (chart)
- Safety on the Farm (chart)

General Motors Corp., Detroit, Mich.
- Diesel Cycle Diagram (chart)
- Automobile Chassis (chart)
- *Putting Progress Through Its Paces* (booklet)
- *Chemistry and Wheels*
- *Metallurgy and Wheels*
- *Transportation Progress*
- *When the Wheels Revolve*
- *Diesel, the Modern Power*
- *We Drivers*
- *Modes and Motors*
- *Electricity and Wheels*
- *Optics and Wheels*
- Three Speed Gear Transmission (chart)
- *Opportunity for Youth*
- *Research Looks to New Horizons*

Goodyear Rubber Co., 1144 E. Market St. Akron, Ohio
- *The Story of the Tire*
- *Rubber and the Goodyear Plantations*

Nordberg Mfg. Co., Milwaukee, Wis.
- *Diesel Engines Supply the Power*
- *Carthage Water and Electric Plant*

Socony-Vacuum Oil Co., 26 Broadway, New York City
- *Petroleum and the Petroleum Industry*

South Bend Lathe Works, South Bend, Ind.
- *How to Run a Lathe* (book) — 25c
- *How to Cut Screw Threads*, No. 36A — 10c
- *How to Ground Cutter Bits*, No. 35 — 10c
- Measuring With Inside Calipers (chart), No. 591 — 10c
- *South Bend Lathes* (catalog)
- Decimal Fractions (chart) — 10c
- How to Become a Machinist (chart) — 10c

United States Rubber Co., Rockefeller Center, New York, N. Y.
- *Four Vital Spots* (booklet on passenger car tire care)
- *How to Make Truck Tires Last Longer* (booklet on truck tire care)
- Tire Mileage Budget Chart (convenient form for budgeting auto tire mileage)

Willard Storage Battery Co., 246–286 E. 131st St., Cleveland, Ohio
- *The Starting and Lighting Battery*
- *The Nerve Center of Ten Million Cars*
- *Willard Catalog Technical Supplement*

Crafts Division

American Crayon Co., Sandusky, Ohio
- *Water Colors Booklet*
- *How to Do Linoleum Block Printing*

American Handicrafts Co., 193 William St., New York, N. Y.
- *General Catalog of Crafts Supplies* — 10c
- *Instructions for Etching*
- *Tool List for Cold Bent Wrought Iron*
- *Tool List for Beaten Art Metal Work*
- *Instructions for Finishes of Iron*
- *Course of Study*

American Reedcraft Corp., 130 Beckman St., New York, N. Y.
- *Projects in Leathercraft*
- *Raffia*
- *Cane Seat Weaving*
- *Colonial Chair Frames*
- *Creative Handicraft*
- *Raffia and Reed*

*Industrial Education Department, A. & M. College of Texas, College Station, Tex.

Berkeley Models, Inc., 230 Steuben St., Brooklyn, N. Y.
1942 Hobby Catalog — 10c
Dennison Mfg. Co., Framingham, Mass.
Flaming Autumn Flowers
Queen Mary Roses
Jiffy Weaving
Magic With Crepe Paper
Gane Bros. & Lane, Inc., 1335 W. Lake St., Chicago, Ill.
Bookbinders Supply Catalog and Samples
Gaylord Bros., Inc., Syracuse, N. Y.
Bookcraft Instruction Manual
Grand Rapids Fibre Cord Co., Grand Rapids, Mich.
Art Fiber Furniture Weaving
Chas. M. Higgins Co., Inc., 271 Ninth St., Brooklyn, N. Y.
History of Ink
A Biography of the Founder
A Friend That Sticks (leaflet)
Write It and Mean It (leaflet)
More Power to Your Pen and Brush (leaflet)
Drafting Standards Accepted and Proposed — 50c
Higgins Correlation Project No. 9
Techniques — 50c
Le Page's, Inc., Gloucester, Mass.
Modern Adhesives and How to Use Them — 10c
LePage's Tool Craft Job Sheet
Do's and Don'ts for Gluing
Glue Facts
National Soap Sculpture Committee, 80 E. 11th St., New York, N. Y.
Soap Sculpture (a digest including instructions for carving in soap)
Entry blank and lesson folder for 19th annual competition
Ohio Leather Co., Girard, Ohio
The Story of Leather
H. H. Perkins Co., 256 Shelton Ave., New Haven, Conn.
Reedcraft
Seatweaving
Price List of Chair Seating Materials
Plymouth Cordage Co., North Plymouth, Mass.
Useful Knots and How to Tie Them (booklet) — Individual copies free
Tanners' Council of America, 100 Gold St., New York, N. Y.
The Romance of Leather — 5c
American Leathers — 50c
Dictionary of Leather Terminology — 10c
Thayer & Chandler, 910 West Van Buren St., Chicago, Ill.
The Idea Book
Air Brushes
Universal Handicrafts Service, Inc., 1267 Sixth Ave., New York, N. Y.
Manual on Non-Firing Clay — 25c
Supplement to Catalog No. 5
Keep Your Engine Tuned — Reprint
Creative Urge in Elderly Groups — Reprint
Satisfying the Ego Through Creative Programs
The Creative Self and Its Significance Today on Crafts
Handicrafts for Health and Happiness
Plasti-Carve Clay Manual — 10c
Marionettes for All Ages — $1.25
Chip Carving Manual — 15c
Old and Discarded Bulletin Series — 10c each; 12 for $1.
Wiler & Co., 1038 Crosby St., Chicago, Ill.
Wildercraft
Woodcraft Equipment Co., Independence, Mo.
A Syllabus on Archery
General Archery Equipment Catalog

Drawing Division

American Crayon Co., Sandusky, Ohio
Water Colors Booklet
How to Do Linoleum Block Printing
Old Faithful Products
Prang Water Colors — 10c
Prang Tempera
Hygieia Blackboard Crayons
Blacker Than Black Drawing Ink
The Second Stencil Book
Prang Textile Colors
Color Harmony Booklet
Sketcho
Textone
Bigelow-Sanford Carpet Co., Inc., 140 Madison Ave., New York, N. Y.
Historical Background of Floor Covering
How to Take Care of Your Rugs and Carpets
Color Clues to Home Beauty
Dietzgen Co., Chicago, Ill.
Use and Care of Drawing Instruments
Frederick Post Co., Hamlin & Avondale Aves., Chicago, Ill.
Decimal Equivalent Transfers
Drawing and Drafting Room Chart
Higgins Ink Co., Inc., 271 Ninth St., Brooklyn, N. Y.
History of Ink
A Biography of the Founder
A Friend That Sticks (leaflet)
Write It and Mean It (leaflet)
More Power to Your Pen and Brush (leaflet)
Drafting Standards Accepted and Proposed — 50c
Higgins Correlation Project No. 9
Techniques — 50c
The Hoover Co., N. Canton, Ohio
How to Use the Modern Color in Your Room
Carpets and Rugs
How to Choose and Use an Electric Cleaner
Six Conservation Projects for Home Economics Students (Available in quantities)
Keuffel & Esser Co., 520 South Dearborn St., Chicago, Ill.
Instructions for Use of Architect's Levels
How to Choose a Slide Rule
Quaker Lace Co., 330 Fifth Ave., New York, N. Y.
Window Decoration — 10c
M. J. Whittall Associates, Inc., Worcester, Mass.
The Making of Whittal Rugs and Carpets
The Care of Whittal Rugs and Carpets
Romance and Traditions of the Far East

Electrical Division

American Telephone and Telegraph Co., 195 Broadway, New York, N. Y.
Magic of Communication
The Birth and Babyhood of Telephone
The Telephone in America
The Telephone Almanac
Burgess Battery Co., Chicago, Ill.
Burgess Snubber Catalog, Bulletin 435
The Burgess Snubbing Principle, Bulletin 430
Diesel Engine Exhaust Silencing, Engineering Report No. 117
Burgess Acousti-Booth, Bulletins 139, 140, 143, 144, 145, 146, 147, 148, 149
Electric Storage Battery Co., Philadelphia, Pa.
Types of Batteries
Fundamentals of the Storage Battery
Instructions on Operating the Battery
Battery Lecture Wall Chart
General Electric Co., 1 River Road, Schenectady, N. Y.
Electrical Laboratory Apparatus
General Electric Motion Pictures
Electric Equipment for Woodworking
Story of Lightning
Science of Every Day Things
The Story of Steinmetz
Research and Invention
The House of Magic
Two Decades of General Electric Leadership
Television
Excursions in Science and Engineering
General Motors Corp., Detroit, Mich.
Electricity and Wheels (booklet)
Optics and Wheels (booklet)
Three Speed Gear Transmission (chart)
Opportunity for Youth (booklet)
Research Looks to New Horizons (booklet)
Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill.
Plastic Rosin-Filled Solders[1]
Kester Fluxes[1]
Kester Viscosifomed Soldering Paste
Kester Trichloron Soldering Salts
Kester Acid-Filled and Plastics Rosin-filled[1]
Facts on Soldering
Rosin-Filled Solders[1]
Solder With Economy
Bar Solder[1]
Corrosion in Soldering
Soldering Tips
Aluminum Solder[1] (none to be manufactured)
How to Use Flux Fill Solders
National Board of Fire Underwriters, 222 W. Adams St., Chicago, Ill.
National Electric Code No. 70
First Aid Fire Appliances
Foam Extinguisher Systems
Sprinkler Equipments
National Electric Products Corp., Pittsburgh, Pa.
The New Way to Wire a House
RCA Manufacturing Co., Inc., Harrison, N. J.
RC-14 *Receiving Tube Manual* — 25c for single copy; 15c quantity educational price
Phototube Folder — single copy free; $3 per 100
RCA Guide for Transmitting Tubes — 35c for single copy; 20c quantity educational price
1275-B *Receiving Tube Booklet* — single copy free; $2.50 per 100
Westinghouse Electric & Mfg. Co., 700 Braddock Ave., East Pittsburgh, Pa.
Westinghouse Extension Courses —
No. 2 — *History of W. E. & M. Co.* — $1.50
No. 3 — *Induction Motors* — $2
No. 4 — *Transformers* — $2.50
No. 10 — *Metering of Alternating Current* — $2.50
No. 11 — *Artificial Light and Its Application* — $1.25
No. 12 — *Electrical Instruments* — $2.50
No. 15 — *Industrial Control* — $2
No. 18 — *Electrical Distribution* — $3.50
No. 25 — *Industrial Electronic Tubes* — $2.75

Industrial Division

American Chicle Co., Thomas Ave. & Manly Sts., Long Island, N. Y.
Facts About Gum
American Medical Ass'n., 535 N. Dearborn St., Chicago, Ill.
Price List of Health Publications
American Radiator Corp., P.O. Box 1226, Pittsburgh, Pa.
Make Better Homes
What the Well-Dressed Kitchen Is Wearing
Planning Better Plumbing for Your Home
Air Conditioning for Your Home
American Viscose Corp., 350 Fifth Ave., New York, N. Y.
What Is Rayon?
Information Regarding Rayon
Rayon From Forest to Fashion (easel display) — 75c
Rayon From Forest to Fashion (small student leaflet for use with easel)
The Miracle of Rayon (kit showing steps in manufacture) — 50c
Anthracite Institute, 19 Rector St., New York, N. Y.
How to Heat Your Home
Mining in Preparation of Anthracite
Anthracite, What It Is and How to Use It
Improving Lawn With Anthracite Ash
The Wonders of Anthracite
Anthracite Burning Equipment
Black Wings of Smoke
Armstrong Cork Co., Lancaster, Pa.
The Story of Cork
The Story of Linoleum
Association of American Railroads, Washington, D. C.
America's Rolling Refrigerators
All Aboard, We're Going Places
The Growth of the Iron Horse
Railroad Facts
Building the Railroad

[1]No samples available; literature gratis.

Science Rides the Rails
Behind the Scenes

The Atchison, Topeka and Santa Fe Railway System, 80 E. Jackson Blvd., Chicago, Ill.
The Railroad
Cross Country Hot Shots
The Michigan Life Conference (limited number available)
The S. F. Introduces Diesel Freight Service (limited number available)

Bausch & Lomb Optical Co., Rochester, N. Y.
The Use and Care of the Microscope
Development and Manufacture of Optical Glass in America
Milestones in Optical History
Illumination in Photomicrography
A Century of Photographic Lenses
Accuracy Requirements in Fifth Place Refractometry

Beech Nut Packing Co., Canajoharie, N. Y.
The Story of Chewing Gum
The Cup of Magic
Tapping a Sapodilla Tree
Chiclero at Work
Coffee Plantation (picture)
Manufacture of Peanut Butter

Belding-Hemingway-Corticelli, 119 West 40th St., New York, N. Y.
The Romantic Story of Silk (folder)
Silk and the Silk Industry — 15c
The Selection and Use of Sewing Threads (folder)

California Fruit Growers Exchange, Los Angeles, Calif.
Training Diets
Citrus on Parade
Orange Juice in School Health Programs
Sunkist Wall Map of California
The Story of California Oranges and Lemons

Chicago Tribune, Chicago, Ill.
Souvenir of Tribune Tower
Trees to Tribune
Refinishing Furniture — 7c

Corn Industries Research Foundation, 270 Broadway, New York, N. Y.
Corn in Industry
Tapping the Treasure in Corn (chart)

Diamond Crystal Salt Co., Inc., St. Clair, Mich.
A Salt for Every Use (to teachers only)

Federal Security Agency, U. S. Office of Education, Washington, D. C.
Index on Vocational Training for Defense Workers
Information for State Supervisors and Local Teacher Trainers
Guidance Leaflets — *Law, Medicine, Dentistry, Journalism, Librarianship, Architecture, Civil Engineering, Electrical Engineering, Mechanical Engineering, Pharmacy, Nursing, Forestry, Music, Veterinary Medicine, Chemistry and Chemical Engineering, Art, Home Economics, Optometry, Osteopathy* — 5c each
Books on Job Finding
Choosing a School or College
Trends in Occupations and Vocations
Individual Guidance
The Occupational Dictionary
Occupational Information
A Guidance Bookshelf
Publications — *Vocational Divisions*
Military Service
List of Occupations
Guidance Bibliography. Occupational Information and Guidance Service
Misc. 2363–1, *Trends in Occupations and Vocations*
Misc. 2363–2, *Choosing a School or College*
Misc. 2363–4, *Books on Job Finding*
Occupational Information and Guidance Service
Misc. 2339, *Individual Guidance*
Misc. 2528, *The Occupational Dictionary As a Tool in Vocational Guidance Work*
Misc. 2395, *80 New Books on Occupations*
Misc. 2590, *A Guidance Bookshelf on Occupations*
Misc. 2150, *Occupations*
Misc. 2976, *Wartime Occupations*
Misc. 2573, *Bibliographies on Occupational Information and Guidance.* An annotated list.
Air-Conditioning Young America
Misc. 2914, *Steps in a Community Occupational Survey*
Misc. 2977, *Women of the U. S. and the War*
Non-Government Sources of Information on National Defense (Education and National Defense Series Pamphlet No. 3)
Government Sources of Information On National Defense (Education and National Defense Series Pamphlet No. 2)
Education for Victory. Official Biweekly of the U. S. Office of Education — $1 per year
Misc. 2491 VE–ND, *Suggested Course Content for Supervisors in Their Training of Industrial Instructors*
Misc. 2855, *Index of Miscellanies and Other Publications on Vocational Training for Defense Workers*
Misc. 2490 VE–ND, *Information for State Supervisors and State and Local Teacher-Training on the Use of Misc. 2491*

General Mills, Inc., Minneapolis, Minn.
Nutrition Study Kit
War Work, A Daybook for the Home

B. F. Goodrich Co., Akron, Ohio
A Wonder Book of Rubber

Hammermill Paper Co., Erie, Pa.
Students' Packet — 10c
Teachers' Packet — 15c
Classroom Exhibit — 25c
Chemistry and Science Exhibit — $1
College and Museum Exhibit — $3

International Harvester Co., Inc., 180 N. Michigan Ave., Chicago, Ill.
Stop Carelessness — 10c

Kellogg Co., Battle Creek, Mich.
Health From Day to Day
Food Allergies
Vitamins in Food
Calories in Food
Food Selection
How Kellogg's Rice Krispies Are Made

Knox Gelatine Laboratories, Johnstown, N. Y.
Four jars containing materials that go into making Knox Gelatine

Kraft Cheese Co., 500 Peshtigo Court, Chicago, Ill.
The Romance of Cheese

Masonite Corp., 111 W. Washington St., Chicago, Ill.
Samples of Products
Literature on Products
Directions for Making Sewing Box and Tool Tray
Instructions for Making Sewing Cabinet
Display of Masonite Processes
"Story of Masonite"

McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y.
Technical Education News (issued periodically during school year and furnished free to teachers and schools)
Textbooks for Training in War Industries and the Armed Forces (descriptive pamphlet covering 167 titles)

Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y.
First Aid
Industrial Safety Education in Schools (single copy to teachers)

Mohawk Carpet Mills, Inc., Amsterdam, N. Y.
Mohawk's Selector
Mohawk Color Guide
The Mohawk Carpet and Rug Manual
Years Can Be Added to the Life of Your Mohawk Rug

Morton Salt Co., Chicago, Ill.
The History of Salt

National Cash Register Co., Dayton, Ohio
Controlling
Expenses in Retail Businesses
Establishing a Retail Business
Talks to Retail Salespeople

National Child Labor Committee, 419 Fourth Ave., New York, N. Y.
Child Labor Facts — single copy free; quantities at 10c each
Child Workers in Wartime — single copy free; quantities at 10c each

National Federation of Coffee Growers of Columbia, 120 Wall St., New York, N. Y.
Acidity of Roasted Coffee
The Land of Coffee
Coffee Map of Columbia

National Geographic Society, Washington, D. C.
Geographic School Bulletins (thirty weekly issues for 25c published during the school year)

New York *Times,* Times Square, New York, N. Y.
A Study of the Newspaper — 10c (for teachers)
How to Use the New York Times in High School English Classes — 10c (for teachers)
Weather — How and Why — 10c (for teachers and students)
News: The Story of How It Is Gathered and Printed — 10c (for teachers and students)
Financial News: How to Read and Interpret It — 25c (for teachers and students)
Wired Photo — News Photos by Phone — 10c (for teachers and students)
Type Faces and Their Ancestry — 10c (for teachers and students)
Introducing the New York Times Into Classes in Economics — 10c (for teachers)
The Story of the Recorded Word — 10c (for students and teachers)
The Newspaper in the Junior High School — 10c (for teachers)
Covering Washington for the New York Times — 10c (for teachers and students)

Occupations, 425 West 123rd St., New York, N. Y.
Vocational Guidance for Victory — The Counselor's Wartime Manual — 50c
104 Reprints From Occupations, covering many different subjects — 5c each

Pacific Coast Borax Co., 51 Madison Ave., New York, N. Y.
First Aid for Housekeepers
Oh, Dear, What Can the Matter Be?

The Pennsylvania Grade Crude Oil Assn., Oil City, Pa.
How Pennsylvania Motor Oil Is Made (text suitable for chemistry courses)

Pillsbury Flour Mills Co., Minneapolis, Minn.
The Story of Flour
Wall Chart — 50c
Flour Facts and Baking Skill
The Art of Successful Baking
Watching Your Baby Grow
"Fightin' Food" (1 copy free to teachers; 10c single copy to others)

Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa.
The Making of a Leader
Plate Glass Manufacture
A Safety Glass for Every Purpose (Hi-Test)
More Daylight, Privacy and Comfort
Glass Blocks

Planters Nut & Chocolate Co., 632 South Main St., Wilkes-Barre, Pa.
What Do You Know About Peanuts

Plate Glass Manufacturers of America, Pittsburgh, Pa.
Plate Glass Booklet (single copy free; for quantities 25c or more each)

Public Affairs Committee, 30 Rockefeller Plaza, New York, N. Y.
Man Meets Job — 10c
1. *Income and Economic Progress* — 10c
5. *Credit for Consumers* — 10c
6. *The South's Place in the Nation* — 10c
8. *This Question of Relief* — 10c
10. *Doctors, Dollars, and Disease* — 10c
14. *Saving Our Soil* — 10c
17. *Why Women Work* — 10c
19. *Can America Build Houses?* — 10c
25. *Machines and Tomorrow's World* — 10c
26. *How Good Are Our Colleges?* — 10c

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27. *Who Can Afford Health?* — 10c
28. *Our Taxes and What They Buy* — 10c
30. *Schools for Tomorrow's Citizens* — 10c
32. *Cooperatives in the U. S.* — 10c
33. *This Problem of Food* — 10c
34. *What Makes Crime?* — 10c
37. *State Trade Walls* — 10c
38. *The Fight on Cancer* — 10c
39. *Loan Sharks and Their Victims* — 10c
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42. *Adrift on the Land* — 10c
43. *Safeguarding Our Civil Liberties* — 10c
44. *59 cents of Your $1 — The Cost of Distribution* — 10c
45. *How Money Works* — 10c
46. *Pensions After Sixty?* — 10c
47. *America's Children* — 10c
50. *Credit Unions — The People's Banks* — 10c
51. *Read Your Labels* — 10c
53. *What It Takes to Make Good in College* — 10c
55. *America's Factories* — 10c
56. *What the New Census Means* — 10c
57. *Man Meets Job — How Uncle Sam Helps* — 10c
59. *Guns, Planes, and Your Pocketbook* — 10c
60. *Better Nursing for America* — 10c
61. *Instalment Selling-Pros and Cons* — 10c
62. *How to Buy Life Insurance* — 10c
63. *More for Your Money* — 10c
64. *How to Check Inflation* — 10c
65. *Prostitution and the War* — 10c
66. *Homes to Live In* — 10c
67. *Government Under Pressure* — 10c
68. *The Coming Crisis in Manpower* — 10c
69. *Vitamins for Health* — 10c
70. *What's Happening to Our Constitution?* — 10c
71. *The Negro and the War* — 10c

(These pamphlets can be purchased at 12 for $1)

Sears-Roebuck & Co., Consumer Education Division, Chicago, Ill.
Table Appointments
Home Furnishings *Slips*
Bedding *Corsetry*
How to Buy Shoes *Fabrics*

The Spool Cotton Co., 745 Fifth Ave., New York, N. Y.
Stitch in Time Saves Nine
Crown Zipper Application Leaflet
Crown Zipper Wall Chart
The Story of Cotton Thread
Thread and Needle Chart
How to Crochet
How to Knit
No. 1210 Educational Exhibit — 50c set
Make and Mend for Victory — 10c[2]
Sew and Save — 10c[2]
Sew What? For Your Home — 10c[2]
The Learn How Book — 10c[2]
Pattern Books on Knitting and Crocheting — 10c copy[2]

Strathmore Paper Co., West Springfield, Mass.
Making Expressive Strathmore Papers

Swift & Co., Union Stock Yards, Chicago, Ill.
Swift's Service to Producer and Consumer
A Direct Road to Market
Dairy and Poultry Products From Farm to Table
Marketing of Dairy Products by the Meat Packer
The Meat Packing Industry in America
Along the Road to Market
1. *List and Index of Agricultural Research Bulletins*
2. *The Story of Meat*
3. *Cuts of Meat*
4. *Cuts of Meat*
5. *About Wool*
6. *Cattle Byproducts*
7. *Cuts of Meat*
8. *Food Values in the Diet*
9. *The Significance of Jewish Holidays to the Livestock Producer*
10. *Lamb Byproducts*
11. *Lamb Feeding*
12. *Soap*
13. *Cuts of Meat*
14. *Hog Production*
15. *Cattle Production and Beef Consumption in the United States*
16. *Packer Profits*
17. *Geography of Meat Production and Consumption*
18. *Swift & Company Booklets*
19. *Hog Byproducts*
20. *Preventing Losses in Handling Livestock*

United States Gypsum Co., 300 West Adams St., Chicago, Ill.
Display of Raw Gypsum and Limestone and products manufactured from them with literature describing these products

United States Rubber Co., 1230 Sixth Ave., New York, N. Y.
Four Vital Spots
How to Make Truck Tires Last Longer
Tire Mileage Budget Chart

Vermont Marble Co., Proctor, Vt.
Miracles in Marble

Wellington Sears Co., 62 Worth St., New York, N. Y.
Facts About Cotton (1 copy free to teachers; 15c for additional copies)
How to Get the Most for Your Money When Buying Towels (1 copy free to teachers)

Wheat Flour Institute, 309 Jackson Blvd., Chicago, Ill.
Through Silken Sieve *From Wheat to Flour*
Enriched Flour
Teachers' Outline on Wheat and Flour
Chart of Wheat Kernel
How Flour Is Milled (single copy to teachers only)

Wm. Wrigley Jr. Co., 410 North Michigan Ave., Chicago, Ill.
How Chewing Gum Helps Your Workers Feel Better and Work Better

Zellerbach Paper Co., 534 Battery St., San Francisco, Calif.
Paper Making and Description of Paper Making.

[2]These books sell at 64c for a complete dozen or for a dozen assortment when purchased direct from Educational Bureau at 54 Clark St., Newark, N. J.

(To be continued)

GRAPHIC-ARTS SHOP ENROLLMENTS*

R. RANDOLPH KARCH**

Much speculation exists on the status of the enrollments in vocational and industrial-arts graphic-arts courses since the outbreak of World War II. The need for such a study has been voiced by many teachers of graphic arts. Generally, the opinion has been that the number of students in this subject has dropped from 25 to 50 per cent in the past year.

This study was made to determine the status of enrollments in the graphic-arts shops on a national scale, and answers were sought for the following questions:

1. How much, if any, have enrollments dropped in vocational high school graphic-arts shops, and in industrial-arts graphic-arts shops which have a vocational objective — that is, actually place graduates and undergraduates in the industry?

2. How many students were placed in the industry in the period from September, 1941, to October, 1942?

3. How many students could have been placed in the industry, if the enrollments had been such to meet the demand for young workers?

*This study covers 111 schools in 28 states, for the period from September, 1941, to October, 1942.

**Principal, Printing High School, Cincinnati, Ohio.

A perusal of the school year's periodical literature showed that no such study had been made, nor was it contemplated.

Method — A survey was made through the medium of double government postal cards. The message to the teachers was as follows:

September 21, 1942

Dear Fellow Teacher:

Your cooperation is important in this study being made on printing-department enrollments, which at the present time are considered to be low because of the war effort.

We are trying to determine the present status of both trade training and industrial-arts classes in high schools.

A report will be mailed to you if you make out and return the attached card.

Your cooperation will be greatly appreciated, and your figures will be kept confidential if you wish it.

The return card contained the following copy:

Enrollment in printing classes, September, 1941 .....

Enrollment in printing classes, September, 1942 .....

Decline, if any, in enrollment .....

Total young men placed in the trades last year .....

How many could you have placed last year? .....

Suggestions and remarks:

Check here if you want your figures kept strictly confidential.

Name .....
School .....
City and State.....

Returns

Two hundred ninety-five schools were selected from the 1942 Directory Number of the National Graphic Arts Education Association's official publication, *Graphic Arts Education*. All states of the United States where vocational and industrial-arts graphic-arts courses were established were included in the mailing list.

Cards were sent out to the schools on September 18, 1942.

Cards returned up to and including October 17, 1942, were distributed as follows:

Vocational departments	46
Industrial-arts schools with vocational objectives	45
Industrial-arts schools	17
Colleges offering graphic-arts courses	3

(Continued on page 20)

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
John J. Metz, Editor

How Valuable Are Your Eyes?

The International Harvester Company of Canada may have gone farther than any other industrial firm in doing its utmost in reducing eye accidents in its plant.

Not only do the shopworkers wear goggles, no matter what job they may be at, but office workers, and even visitors, must wear safety goggles when they enter the shop.

The firm's slogan, "Where eyes are concerned, there are no nonhazardous occupations in Harvester plants," has accomplished wonderful results. Since 1901 the firm's Hamilton plant has had but one eye injury involving total loss of vision.

This is indeed a wonderful showing. This firm has not only set a mark for other industrial shops to shoot at, but it also sets a fine example which school shops may well study.

Why Not A Testing Program

The end of the first semester of the school year 1942–43 is approaching swiftly. With this ending looms also the question of examinations, tests, grades, and the like.

Numerous tests have been developed by shop teachers throughout this country. Some of them have been published, some even standardized. INDUSTRIAL ARTS AND VOCATIONAL EDUCATION has presented many tests to its readers and, yet, too many shop teachers still are satisfied to guess at what their students know or what they can do.

Some of the younger shop teachers have had a course of testing in their college courses, but many of the older men are not so fortunate, and hence they have serious misgivings about adopting any one test. Then there are some who satisfy themselves with the argument that they cannot use tests made by others because such tests were not made for testing anything but the other teacher's courses.

Then, too, many teachers feel that the tests usually published contain statements that could be greatly improved. Following the usual human habit of exaggerating, these instructors simply dismiss tests produced by someone else as tests that cannot be used because they are of too low a caliber.

There is still another type of objectors to the many tests available to shop teachers. These men, not having been accustomed to using tests, are afraid of having their own work measured by a device used for measuring the work of other teachers. Could they but overcome this fear, they would find out, once for all, whether their fears were well grounded. As it is, they refuse to use tests, and thereby continue to live with a fear which, in most cases, is unfounded.

No workman will hesitate to apply any required gauge to insure the accuracy of his work. Why should teachers hesitate to do the same with their work.

Probably the best method of making testing material readily available for future use is the one described in an article entitled "Card File Test Building," by Van Duzee and Rose, on page 240 in the June, 1939, number of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. This method is very flexible and is easily kept up to date. When once adopted, a new test can be constructed in a matter of minutes, and the teacher can choose test statements that are specially adapted to his own course. A review of this article may be very helpful at this time.

At any rate, those school shop instructors who have not as yet become test conscious, should not let this first semester of 1942–43 pass without inaugurating a testing program that will help both themselves and the students in their classes.

Women Need Specialized Training

Under present conditions, the school shop is becoming much more coeducational than it has ever been. To many of the shop teachers this may present an almost insolvable problem. Like every new task, it contains many factors that appear highly troublesome.

It is well, however, to tackle this job with the same vigor and energy usually applied to other special tasks that come up during the school year. Those instructors who have already enrolled girls and women in their regular boys' and mens' classes have discovered that their early fears about trying such a coeducational venture are clearly baseless.

The present war, with its huge production requirements, demands more skilled and semiskilled workers than can be obtained in the labor market; hence, it is imperative that all possible sources be thoroughly explored to find those who can add their bit to increase the number of workers who are now so desperately needed.

Great strides have already been made in preparing women for the various jobs which they can handle. How well this is done in one of our large industrial cities may be learned by reading Mr. Earl L. Bedell's article on "Training Women for Wartime Industries," on page 1 of this issue.

That many women have been prepared to work on the power tools in the machine shop, and as inspectors and assemblers of the smaller pieces of the many types of mechanisms used, is not surprising. One wonders, however, what jobs they would find in the shipyards. Reports have it, however, that women are engaged in this work too.

Knowing all this, it behooves shop teachers to study all the factors involved, so that when the time comes for them to expand their work so that both sexes may receive training in their shops, the transition from the traditional shop into the coeducational set-up may be made as quickly as possible.

Agriculture for City Youth

The college of agriculture of the University of Illinois has appointed a committee of its faculty members to prepare 12 lessons on farm work which may be used to prepare boys and girls in city schools, for working on farms in the summer.

These lessons will be printed in pamphlet form so that the student may use them both as a text and for future reference. This method of training city youth for farm work is commendable, and it is hoped that it will help solve the problem of farm-labor shortage which will become increasingly more acute as our war effort places greater emphasis on industrial war production.

It is hoped also that teachers in city schools will take an interest in this work and help it along in every way as teachers, counselors, and as placement officers.

(Continued from page 18)

Returned unanswered	8
Not returned as of October 17, 1942	176
	295

Cards sent to the colleges were merely to announce that such a study was being made. Approximately a dozen college departments received the mailing.

A quick check seemed expedient, although undoubtedly more cards will be returned. No mention was made in the study when the returns were needed for final checking.

Limitations

The writer admits the following probable limitations in this study:

1. Schools with low enrollments may have had less of a desire to answer the questions.

2. The sampling may not have been large enough to give a complete picture.

3. The line on the card asking if figures should be kept confidential may have been confusing to some as to the use made of the study. Thirty-two per cent of the cards returned were marked so that figures would be kept in confidence.

Scope of the Survey

Twenty-eight states and the District of Columbia were represented in the results of the study of enrollments. The number of schools sending in returns was 111, distributed geographically as follows:

State	*Vocational*	*Industrial-Arts Vocational*	*Industrial Arts*	*College*
California	3	0	0	0
Colorado	0	1	0	0
Connecticut	2	0	0	0
Delaware	1	0	0	0
District of Columbia	1	1	0	0
Illinois	1	5	0	0
Indiana	1	2	0	1
Iowa	0	1	1	0
Kansas	1	4	0	1
Louisiana	0	1	0	0
Maine	0	1	0	0
Maryland	1	0	0	0
Massachusetts	6	2	1	0
Michigan	2	1	0	0
Minnesota	2	0	0	0
Missouri	2	0	0	0
Nebraska	0	2	0	0
New Hampshire	0	1	0	0
New Jersey	2	3	4	0
New York	3	2	5	1
North Carolina	0	1	0	0
North Dakota	0	1	0	0
Ohio	1	4	4	0
Oklahoma	0	1	0	0
Pennsylvania	3	4	1	1
Tennessee	1	0	0	0
Texas	4	1	0	0
West Virginia	0	2	1	0
Wisconsin	9	4	0	0
Totals	46	45	17	3

Status in Vocational Departments

Eleven vocational high school graphic-arts departments showed a total gain in the number of students from 1941 to 1942 of 171, or from 628 to 799. The increase was about 27 per cent.

However, most of the vocational departments, or 35, showed a loss in the number of students from 1941 to 1942. This drop was from 2284 to 1705 — or 579, and about 25 per cent.

Gains were explained in instances as follows, quoted from the remarks made on individual cards:

Enrollment this year is partly made up of part-time students who have no choice as to shop.

Twenty girls have elected this subject.

The gain was accomplished by contact with placement and guidance officials in the junior (high) schools as well as in this school.

We have found a more encouraging interest on the part of prospective students in this course this year, probably due to the realization that many of the hundreds of machine tool operators being trained during the national emergency will eventually have to be retrained in some other occupation.

The following poster was used to gain enrollment:

After the War, will you be prepared to take advantage of those opportunities that will come when our nation turns from war to the good old American way of life? Advertisers will come to life again; buyers of printing will begin to look for new sources of good printing and new products created during the national defense rush will depend on the printed word for publicity. Printers will be in demand and opportunities in the printing industry will be the greatest in a century. Munition makers, machinists, welders, etc., may be less in demand, but — if you are trained to fill a job in printing you will be very fortunate. The Board of Public Education of Pittsburgh provides *free* training in printing to boys over 14 years of age who have completed the eighth grade. Boys who complete the printing course will be trained to fill good positions in first-class printing establishments. Make application at the school now. Clifford B. Connelley, Vocational High School, Pittsburgh, Pa.

. . . there has been a sharp decrease over previous years.

. . . we have some who are waiting their chance to enter welding, machine, or some other so-called defense course.

The . . . school has undertaken an extensive national defense training program for young men and women over the age of 18. The shops in which these classes are being conducted are therefore closed to many students under the age of 18 who would have ordinarily enrolled in them.

We solicit students who show promise from other schools . . . a little "spade" work in the other schools draws attention. . . . Vocational work in this city is new, hence the attraction.

Vocational Printing Departments Showing Gains in Enrollments

School	*Enrollment 1941*	*1942*	*Gain*
1	12	74	62
2	12	14	2
3	6	7	1
4	18	30	12
5	143	168	25
6	150	187	37
7	29	36	7
8	24	25	1
9	36	43	7
10	28	31	3
11	170	184	14
	628	799	171

Vocational Graphic-Arts Departments Showing Losses in Enrollments

School	*Enrollment 1941*	*1942*	*Loss*
1	24	19	5
2	38	16	22
3	34	18	16
4	12	10	2
5	27	25	2
6	88	87	1
7	384	317	67
8	108	82	26
9	20	9	11
10	57	42	15
11	15	10	5
12	61	54	7
13	80	72	8
14	125	120	5
15	111	57	54
16	144	128	16
17	16	7	9
18	89	73	16
19	32	9	13
20	42	23	19
21	81	46	35
22	50	40	10
23	32	10	22
24	38	24	14
25	26	15	11
26	56	31	25
27	27	14	13
28	36	23	13
29	40	20	20
30	31	16	15
31	75	50	25
32	192	186	6
33	46	21	25
34	28	14	14
35	19	17	2
	2284	1705	579

Reasons for Losses in Enrollments in Vocational Departments

Interesting and significant reasons were given for losses in enrollments in the vocational departments. The information below is taken from the remarks section of the return cards:

Trade boys who took printing last year are now taking woodworking and drawing this year.

My decline in enrollment is due to the fact that I started a week late, and the uncertainty as to the length of time I'd be here. Therefore, students drifted to other courses.

Decline in printing enrollment is normal in such a time as this, and it will mount up to high figures as soon as peace comes.

Two factors are considered: Switch to war trades both in school and war-production work,

and a lowering of all junior high enrollment (city-wide because of population trend).

One instructor short.

My classes could have been a little larger but they were held down by order of the . . . director.

Enrollment would not drop if we had men in . . . advisement who had vision which extended beyond the length of their noses.

Balance of students on the job.

There is a drop of 10 to 12 per cent in total school enrollment.

Many boys felt obligated to take work in defense plants because of their contribution to the war effort. Others were attracted by the higher wages.

This course is showing a steady decline in popularity. The employers and union ought to look into it.

Business is poor, but the printers have lost so many workers to war industries and the armed forces that they are now willing to employ students with but one year of training.

Shop operating half time this year.

Printing business in a big slump! Nothing to do.

The boys I normally receive are all in service.

Status in Industrial-Arts Departments With Vocational Objectives

The enrollment of 32 industrial-arts graphic-arts courses with vocational objectives shows a total of 2967 for 1941, and 2285 for 1942 — a drop of 682, or 23 per cent.

Those in the same category with larger enrollments in 1942 than in 1941 numbered 13. A total increase of 208 students was shown over 1941 in 1942 — 1223 in 1941, 1431 in 1942 — a 17 per cent increase.

Industrial-Arts Graphic-Arts Courses With Vocational Objectives Showing Gains in Enrollments

	Enrollment		
School	*1941*	*1942*	*Gain*
1	140	160	20
2	82	93	11
3	60	75	15
4	50	50	
5	120	120	
6	240	280	40
7	75	95	20
8	31	34	3
9	42	44	2
10	120	160	40
11	103	116	13
12	40	54	14
13	120	150	30
	1223	1431	208

Reasons for Increases in Enrollments in Industrial-Arts Courses With Vocational Objectives

Comments on the increases in enrollments are explained as follows by participants of the study:

This city has had and is having a defense boom. After the war, printing employment should expand greatly, while employment in defense stimulated vocations is likely to be depressed.

Demand for printers greatly increased, but few applicants.

My classes are increasing all of the time — I have two overtime periods now.

There has been an increase in vocational enrollment. There is an urgent need for boys and girls this year.

Industrial-Arts Graphic-Arts Courses With Vocational Objectives Showing Losses in Enrollments

	Enrollment		
School	*1941*	*1942*	*Loss*
1	24	19	5
2	84	73	11
3	64	56	8
4	89	80	9
5	50	26	24
6	162	141	21
7	80	76	4
8	50	30	20
9	86	47	39
10	74	44	30
11	150	135	15
12	100	95	5
13	106	65	41
14	89	66	23
15	114	70	44
16	123	87	36
17	20	17	3
18	120	85	35
19	132	126	6
20	125	105	20
21	82	68	14
22	150	136	14
23	30	25	5
24	200	175	25
25	91	72	19
26	119	105	14
27	15	13	2
28	199	120	79
29	60	30	30
30	81	34	47
31	72	52	20
32	26	12	14
	2967	2285	682

Reasons for Decreases in Enrollments in Industrial-Arts Courses With Vocational Objectives

Reasons for decreases in this type of school course were listed as follows from the return cards:

We are swamped for skilled operators in country shops, and two-thirder printers.

Subject is purely elective junior and senior years together with machine shop and electricity. War conditions prompt shift to these (last) subjects.

Decline due to printing instructor teaching electricity also. This makes scheduling difficult and some students have to drop this subject.

Many apprentices are being taken due to effect brought about by drafting men in the Army.

War has definitely reduced our enrollment. Many are taking preaviation, math and science; others working in war industries seven days a week and making real wages.

Decrease principally due to new aircraft course and the trend toward more math and physical sciences.

Printers' wages too low to attract graduates; metal trades pay higher wages and printers get jobs in metal trades.

Industry has not cooperated. Boys here are beginning to wake up to the fact that there is going to be an oversupply of machinists and a shortage of printers.

There was a large increase in mechanical drawing.

Many students have gone into other lines which pay more. They want to make big money rather than finish learning a trade.

Too many going into welding, machine shop, and metal trades.

School enrollment dropped from 2000 to 1400.

Industrial-Arts Objective Courses (Nontrade Training)

The 15 purely industrial-arts courses, that is, those who make no attempt at placing workers in the graphic arts, have significance here only in showing what may be happening in the nontrade training area over a period of one year. In 1941, 1432 were enrolled; in 1942, only 1209. Four schools showed gains; 11 showed a drop or remained static. The over-all drop was 223 students — about 15½ per cent. The sampling here is probably too small to be accurate.

Industrial-Arts Graphic-Arts Courses Showing Gains and Losses

	Enrollment			
School	*1941*	*1942*	*Loss*	*Gain*
1	253	255	0	2
2	20	12	8	0
3	8	26	0	18
4	30	30	0	0
5	112	115	0	3
6	89	70	19	0
7	84	0	84	0
8	15	9	6	0
9	78	81	0	3
10	182	139	43	0
11	84	62	22	0
12	54	44	10	0
13	125	100	25	0
14	130	126	4	0
15	168	140	28	0
	1432	1209	249	26

Placements and Placement Possibilities Vocational Schools Showing Gains in Enrollments

School	*Placed*	*Could Have Placed*
1	8	18
2	4	8
3	2	6
4	5	5
5	33	
6	22	
7	10	15
8	15	12
9	15	20
10	15	30
11	12	30
	141	144

Placements and Possible Placements

A grand total of 1048 students were placed in the graphic-arts industry by the 91 vocationally minded schools reporting. The 17 purely industrial-arts schools placed no students as reported, and no figures are presented here for the three colleges.

Placements and Placement Possibilities
Vocational Schools Showing Losses in Enrollments

School	*Placed*	*Could Have Placed*
1	3	0
2	1	4
3	36	60
4	3	4
5	5	8
6	20	25
7	68	136
8	27	48
9	6	10
10	31	43
11	6	12
12	8	12
13	22	31
14	10	15
15	46	75
16	8	9
17	5	10
18	46	60
19	13	20
20	5	0
21	21	12
22	15	25
23	18	45
24	7	
25	9	15
26	17	30
27	17	50
28	7	12
29	30	45
30	15	1
31	8	8
32	40	52
33	11	15
34	10	17
35	8	10
	602	919

In addition to the 1048 placements, 1415 could have been placed on jobs — if the graphic-arts departments had had the number of students to take advantage of all requests for workers.

The following tables give the general breakdown in all areas:

Conclusions

In September, 1941, 91 schools which placed young men in the industry of the graphic arts had a total enrollment of 7102.

In September, 1942, this enrollment dropped to 6220.

This means that 882 fewer students are studying and preparing for entrance into the graphic-arts industries. This is a 12½ per cent decrease.

In an estimated 1000 schools, this would total almost 10,000 student learners — who, for this year alone — are possibly lost to the graphic-arts industry, if this sampling of 91 schools in 28 states is sufficiently large to be a criteria for the nation as a whole.

Placements in the industry by schools with vocational objectives total 1048. On this basis, we might estimate that the schools of the entire country placed probably 10,000 young workers.

The total number of jobs in the graphic-arts industry which schools could have filled — if they had had the number of students necessary — totaled 1415. On this same basis, the schools as a whole might have placed almost 14,000 workers in addition to the estimated 10,000.

Placements and Placement Possibilities
Industrial-Arts (Vocational) Schools Showing Loss in Enrollment

School	*Placed*	*Could Have Placed*
1	2	
2	7	
3	5	7
4	3	
5	3	
6	8	11
7	6	8
8	2	
9	8	12
10	3	3
11	6	0
12	5	15
13	4	6
14	3	10
15	3	16
16	15	18
17		
18	2	
19	5	8
20	2	4
21	3	4
22	17	0
23	6	15
24	5	8
25	4	4
26	6	6
27	9	0
28		6
29		
30	6	12
31	3	10
32	1	6
	152	189

Placements and Placement Possibilities
Industrial-Arts (Vocational) Schools Showing Gains in Enrollment

School	*Placed*	*Could Have Placed*
1	8	
2	2	0
3	4	8
4	6	10
5	6	18
6	18	
7	5	
8	9	12
9	3	5
10	73	100
11	5	10
12	4	
13	10	
	153	163

Testing and Tests

AIRCRAFT SHEET-METAL TEST

HAROLD L. STILES
Senior High School
Tucson, Ariz.

1. This test contains 75 true-false statements.
2. Read each statement carefully.
3. If you think that the statement is true, put an X in the parentheses before the statement.
4. If you think the statement is false, put a zero in the parentheses before the statement.
5. Study the samples carefully before beginning actual work.

Samples:

(X) 1. Bolts and rivets are used in aircraft construction.

(0) 2. Aluminum is an alloy.

Test Statements:

( ) 1. The abbreviation *A C* signifies the part which carries the approval of the Army Air Corps.

( ) 2. Aluminum rivets are recognized by the small projection on the head of the rivet.

( ) 3. The flutes on a twist drill form the cutting edge on its point.

( ) 4. The size of a drill is stamped on the shank.

( ) 5. The head of a rivet is put next to the thinnest material unless otherwise specified.

( ) 6. Gunning a rivet too long causes it to lose some of its strength and physical properties.

( ) 7. Some aircraft rivets are dyed blue for identification purposes only.

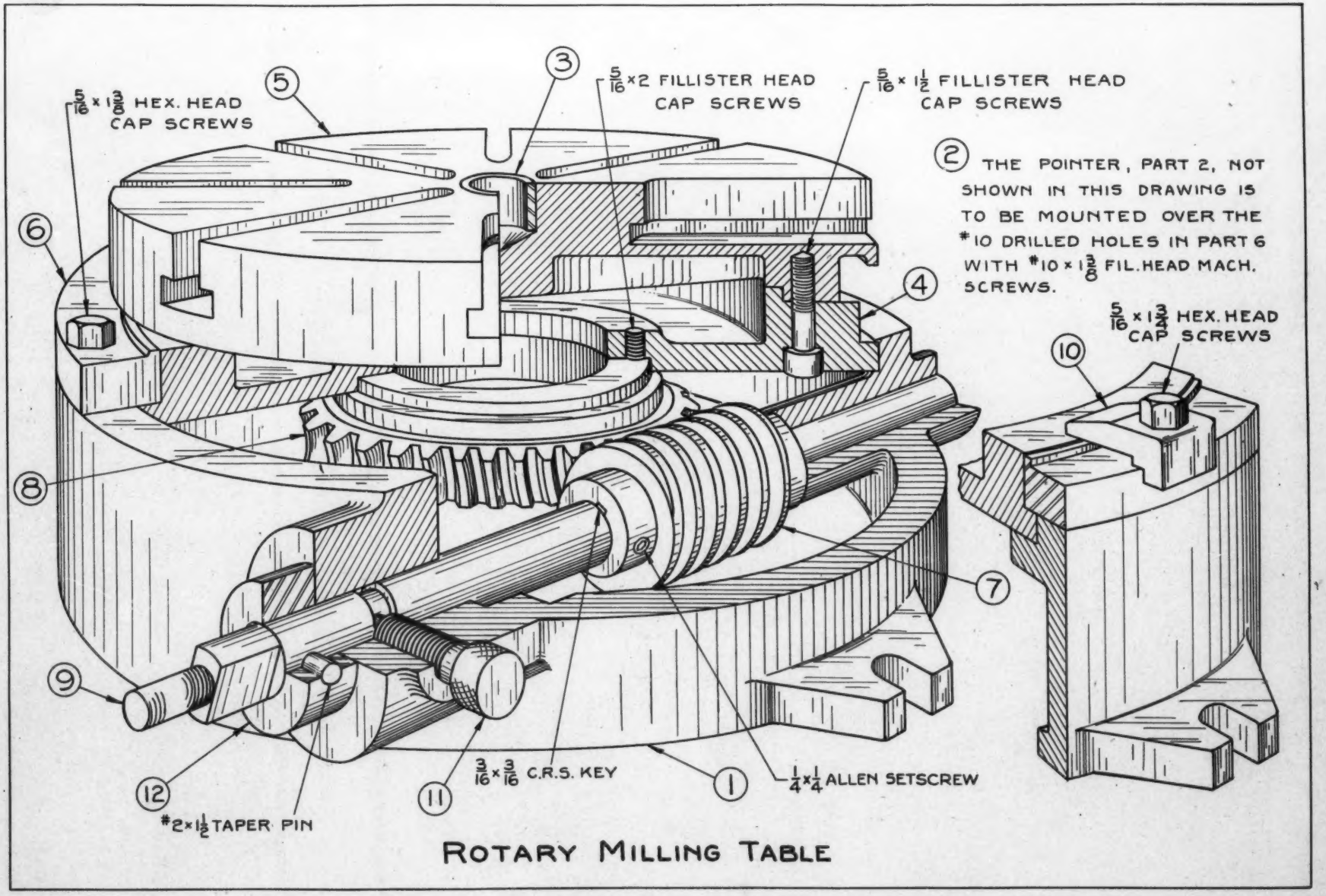
( ) 8. Longerons are numbered from the top to the bottom of the fuselage.

( ) 9. 17S rivets must be heat-treated before using.

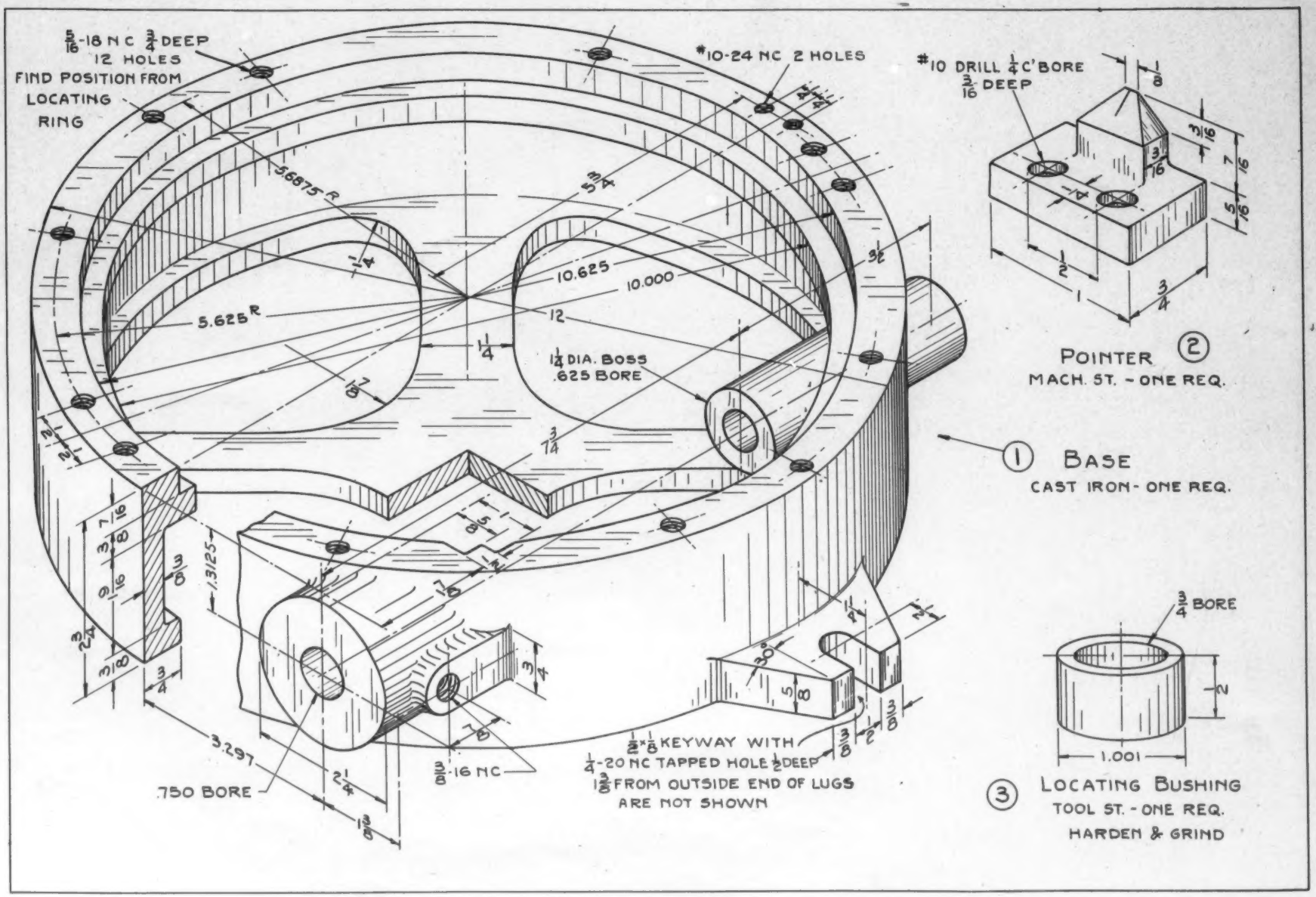
( ) 10. Vixen files are made with curved teeth.

( ) 11. The threads of a bolt should not extend beyond the end of the nut.

(Continued on page 27)


5/16 x 1 3/8 HEX. HEAD CAP SCREWS
5/16 x 2 FILLISTER HEAD CAP SCREWS
5/16 x 1 1/2 FILLISTER HEAD CAP SCREWS
(2) THE POINTER, PART 2, NOT SHOWN IN THIS DRAWING IS TO BE MOUNTED OVER THE #10 DRILLED HOLES IN PART 6 WITH #10 x 1 3/8 FIL. HEAD MACH. SCREWS.
5/16 x 1 3/4 HEX. HEAD CAP SCREWS
3/16 x 3/16 C.R.S. KEY
1/4 x 1/4 ALLEN SETSCREW
#2 x 1 1/2 TAPER PIN
ROTARY MILLING TABLE

Rotary milling table assembly by William A. DeVette, Technical High School, Erie, Pa.
(For description see page 30)



Rotary milling table details by William A. DeVette, Technical High School, Erie, Pa.

(For description see page 30)

(Continued from page 22)

( ) 12. Modified brazier head rivets are used for skins.
( ) 13. DD rivets have two raised dashes on their heads.
( ) 14. Rivet holes that are too big for the rivet may cause a clincher.
( ) 15. 3S rivets are made from pure aluminum.
( ) 16. The diameter of the bucked head of a rivet should be about one and one-half times the diameter of the shank of the rivet.
( ) 17. The melting point of aluminum is 1550 degrees F.
( ) 18. The letter T indicates that the material has been heat-treated.
( ) 19. SRT indicates that the material has been strain hardened after heat-treatment.
( ) 20. The length of rivet to use is found by multiplying the thickness of the material by two.
( ) 21. AD rivets are made from A17S alloy.
( ) 22. Soft pencils are used in aircraft layout work to avoid scratching the material.
( ) 23. Roundhead rivets are used on dimpled work.
( ) 24. Soft or annealed alloys are designated by the letter O.
( ) 25. To find the height of the bucked head of a rivet multiply the diameter of the rivet by one and one half.
( ) 26. SO material is used for forming.
( ) 27. The most common stainless steel alloys contain chromium and nickel.
( ) 28. One eighth of an inch equals 0.1250.
( ) 29. The fire wall is between the engine and the air screw.
( ) 30. Both legs of hermaphrodite calipers are sharpened.
( ) 31. The vertical fin is stationary.
( ) 32. Trim tabs help control the ship.
( ) 33. Center punches are ground to an angle of 30 deg.
( ) 34. A 3–48 machine screw is smaller in diameter than a 5–40 machine screw.
( ) 35. The bar folder can be adjusted to any width of bend.
( ) 36. Stringers are V, Z, and L shaped.
( ) 37. The edge allowance for a wired edge is one and one-half times the diameter of the wire.
( ) 38. In the fabrication of bulkheads 2480 alloy is ordinarily used.
( ) 39. Lightening holes have flanged surfaces.
( ) 40. The chord of a wing extends from the wing tip to the fuselage.
( ) 41. Vixen files have double cutting teeth.
( ) 42. The length of a file includes the tang.
( ) 43. Outside curves may be cut with aviation snips.
( ) 44. A number 30 drill is .125 of an inch in diameter.
( ) 45. The largest letter-size drill is .234 of an inch in diameter.
( ) 46. Transfer punches are used in template work.
( ) 47. The minimum distance between center of rivet and edge of shell is two times the rivet diameter.
( ) 48. The nonheat-treatable aluminum can only be strain hardened.
( ) 49. 24SO material is heat-treatable.
( ) 50. Dimpling is done with a countersinking tool.
( ) 51. To enlarge a portion of a drill hole for fillister head screws a counterboring tool is used.
( ) 52. Anodizing is done by passing direct current through an acid solution in which the material has been immersed.
( ) 53. Alclad material is covered with a layer of pure aluminum which is equal to 25 per cent of the thickness of the piece.
( ) 54. Cleco sheet holders are made in various sizes.
( ) 55. The adjusting sleeve on a rivet gun is used to control the blows per minute.
( ) 56. To increase the blows per minute on a rivet gun, turn the adjusting sleeve clockwise.
( ) 57. Sheet-metal screws are self-tapping.
( ) 58. A number 40 drill is larger than a number 30 drill.
( ) 59. A letter A drill is larger than a letter Z drill.
( ) 60. The lip clearance of a drill should be about 59 deg.
( ) 61. Cadmium-plated nickel steel machine screws have an X stamped on the head for identification purposes.
( ) 62. Castle aircraft nuts are made with round-bottom castellations only.
( ) 63. Aircraft check nuts are thinner than plain aircraft nuts.
( ) 64. A number 60 drill is larger than a 59 drill.
( ) 65. Flaps are used to increase the lift when the plane is leaving the ground.
( ) 66. Wing station 30 is 30 inches from station O.
( ) 67. The fourth spar of a wing is known as the rear spar.
( ) 68. The wing is made just strong enough to carry its own weight.
( ) 69. The in-board section of the wing is attached to the fuselage.
( ) 70. Metal is annealed by heating to a certain temperature and cooled as desired.
( ) 71. Extruded sections are made on a brake.
( ) 72. Clevis bolts have round heads.
( ) 73. Elastic stop nuts are fitted with a fiber washer.
( ) 74. Approximately 40 per cent of the lift is created by the top of the wing and 60 per cent by the bottom.
( ) 75. Aircraft snips are used to cut thin metal.

Key

1. x	16. x	31. x	46. x	61. x
2. 0	17. 0	32. x	47. x	62. 0
3. x	18. x	33. 0	48. x	63. x
4. x	19. x	34. x	49. x	64. 0
5. x	20. 0	35. 0	50. 0	65. x
6. x	21. x	36. x	51. x	66. x
7. x	22. x	37. 0	52. x	67. 0
8. x	23. 0	38. x	53. 0	68. 0
9. x	24. x	39. x	54. x	69. x
10. x	25. 0	40. 0	55. x	70. x
11. 0	26. x	41. 0	56. 0	71. 0
12. x	27. x	42. 0	57. x	72. 0
13. x	28. x	43. x	58. 0	73. x
14. x	29. 0	44. 0	59. 0	74. 0
15. 0	30. 0	45. 0	60. 0	75. x

TESTS FOR PREFLIGHT AVIATION COURSE

HAROLD THEODORE GLENN

David Starr Jordan High School
Long Beach, Calif.

Test — Unit I

1. The inventor of the airplane was .....
2. The inventor of the parachute was .....
3. Otto Lilienthal was noted for .....
.....
4. The first powered airplane flight with man aboard was made in ..... by .....
5. Give two specifications of the first airplane purchased by the U.S.A.: 1. .....
2. .....
6. The first all metal plane was made by ..... in .....
7. Louis Bleriot was first to fly .....
8. The first man to fly across the Atlantic was .....
9. The first flight across the North Pole was made by ..... in .....
10. The first flight around the world was made by ..... in .....
11. In the army, one gold bar signifies the rank of .....
12. Two silver bars, the rank of .....
13. Four stars, the rank of .....
14. Eagle, the rank of .....
15. In the navy one stripe indicates .....
16. Two stripes indicate .....
17. Two and a half stripes indicate a .....
18. Four stripes indicate a .....
19. Four stars indicate an .....
20. List ten opportunities for you in civil aviation today:
.....
.....
.....

Test — Unit II

1. A land plane is identified by .....
2. A flying boat by .....
3. An ornithopter by .....
4. A glider by .....
5. An aerostat by .....
6. An autogiro by .....
7. The empennage consists of the following four major parts:
1. ..... 2. .....
3. ..... 4. .....
8. Give three uses of the fuselage: 1. .....
2. ..... 3. .....
9. Give five different monoplane wing types looking at the plane from the front:
1. ..... 2. .....
3. ..... 4. ..... 5. .....
10. Give five different wing shapes looking at the plane from underneath: 1. .....
2. ..... 3. .....
4. ..... 5. .....
11. Give three different tail surfaces: 1. .....
2. ..... 3. .....
12. Name ten kinds of materials used in aircraft:
1. ..... 5. ..... 8. .....
2. ..... 6. ..... 9. .....
3. ..... 7. ..... 10. .....
4. .....
13. Name eight parts of a wing:
1. ..... 4. ..... 7. .....
2. ..... 5. ..... 8. .....
3. ..... 6. .....

Test — Unit III

1. A body at rest tends to ..... and a body in motion tends to .....
2. To every action there is an ..... and ..... reaction.
3. When a gas traveling in a pipe is restricted the speed of the gas is ..... and the pressure .....
4. The speed of the gas over the airfoil is increased; therefore, the pressure is .....
5. Eddy currents are created by turbulence and they create .....
6. Show the four fundamental forces of an aircraft by means of vectors:
   a) in steady flight
   b) accelerating
   c) slowing down
7. Pushing the joy stick forward causes the elevator to .....
   (raise or lower)
8. Pressing the joy stick to the left causes the left aileron to .....
   (raise or lower)
9. Pressing the left pedal causes the rudder to move to the .....
   (left or right)
10. Lateral stability is obtained by .....
11. Longitudinal stability is obtained by the .....
12. Yawing stability is controlled by the .....
13. Torque of the propeller turning clockwise from the cockpit is corrected by washing in the ..... wing and washing out the .....
14. The tendency to yaw due to wash in is overcome by setting the ..... at an angle to the fuselage.
15. Thrust of a propeller is obtained by its screwing action through the air and the .....
16. Coaxial propellers are ....
17. Show a block under: (Indicate the forces by arrows)
    a) tension
    b) compression
    c) bending strain
    d) shearing action
    e) torsion
18. A glider has ..... (larger or smaller) wings than a pursuit ship.
19. A thermal current of air always goes ..... (up or down)

Key — Unit I

1. Leonardo Da Vinci
2. Leonardo Da Vinci
3. Gliders and records kept of experiments on airfoils
4. 1905; Wright Brothers
5. Stay aloft 1 hour; fly 40 m.p.h.
6. Henry Ford; 1930
7. The English Channel
8. Charles Lindbergh
9. Admiral Byrd; 1921
10. Howard Hughes; 1938
11. Second Lieutenant
12. Captain
13. General
14. Colonel
15. Ensign
16. Lieutenant (senior grade)
17. Lieutenant Commander
18. Captain
19. Admiral
20. Pilot, copilot, test pilot, navigator, radio engineer, instructor, dispatcher, flight engineer, mechanic, construction mechanic.

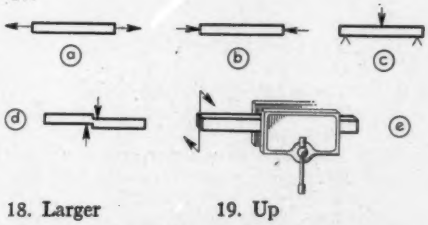
Key — Unit II

1. Wheels
2. A hull
3. Flapping wings
4. No motor
5. Gas bag
6. Rotary wing
7. Fin; stabilizer; rudder; elevator
8. Hold power plant; support empennage; house controls
9. Parasol; high wing; midwing; low wing; gull wing
10. Rectangular; double taper; swept forward taper; swept back taper; elliptical
11. Single rudder; double rudder; double rudder dihedral angle
12. Aluminum; steel; magnesium; chromium; linen; petroleum plastics; coaltar plastics; spruce; balsa; plywood
13. Spar; rib; false rib; aileron; flaps; leading edge; trailing edge; slots

Key — Unit III

1. To remain at rest; to remain in motion
2. Equal; opposite
3. Increased; decreased
4. Decreased
5. Drag
6.

7. Lower
8. Raise
9. Left
10. Dihedral wing angle
11. Stabilizer
12. Fin
13. Left; right wing
14. Fin
15. Pull obtained by the low pressure area in the front of the blade shaped like an airfoil.
16. Two propellers on the same shaft rotating in opposite directions in order to equalize torque.
17.



18. Larger
19. Up

TEST IN AIRPLANE CONSTRUCTION AND MAINTENANCE

WILLIAM H. BOWERS
High School
Tuckahoe, N. Y.

Directions: On the following pages there are 97 statements, some true, some false. If, in your opinion the statement is a true one, place a capital *T* before it. If the statement is a false one place an *F* before same. Deduct 1 per cent for each statement answered incorrectly.

( ) 1. Maple wood, because of its straight grain is used for model plane construction.
( ) 2. Cedar and poplar are used for making propellers.
( ) 3. The designer is the most important factor in the rapidly growing aircraft industry.
( ) 4. A high school education is sufficient to enable one to design a plane acceptable to an aircraft manufacturer.
( ) 5. Micro film is a thin covering for heavy rubber powered model planes.
( ) 6. Silk is sometimes used to cover model planes.
( ) 7. Aircraft dope is used to stick paper to wood.
( ) 8. Rubber spoils quickly unless it is kept in a metal container.
( ) 9. Aluminum tubing is often used for landing gear struts.
( ) 10. Cellophane is used as a covering for the wings of a plane.
( ) 11. Pins are used to fasten model parts together.
( ) 12. The power that causes the *lift* in an airplane is its propeller.
( ) 13. The propeller blades set at an angle cut their way through the air.
( ) 14. Gravity is a lifting force of nature which will hold a plane in the air.
( ) 15. The forward pull of the propeller is called *drag*.
( ) 16. An aileron is a fixed member of a plane wing.
( ) 17. The altimeter measures the speed of a plane.
( ) 18. The elevator is operated by a fore and aft movement of the controls.
( ) 19. The controls enable a pilot to regulate the speed of a plane.
( ) 20. The purpose of the fin is to regulate stability.
( ) 21. The glider plane is heavier than the air.
( ) 22. The power plant is usually enclosed by a longeron.
( ) 23. An Ornithopter has flapping wings.
( ) 24. The Autogiro and the Ornithopter are alike in appearance.
( ) 25. A large landing field is necessary to operate an Autogiro.
( ) 26. It is possible to remain in the air for ten hours, in a glider.
( ) 27. Sir Geo. Caley flew five miles in a glider in 1865.
( ) 28. Otto Lilienthal made over 2000 gliders in 1871.
( ) 29. Octave Chanute was born in Norway.
( ) 30. Samuel Langley was successful in his attempt to carry a man in his airplane.
( ) 31. Wilbur and Orville Wright were from Waterbury, Conn.
( ) 32. The Wright Brothers worked on a scientific basis in their attempts at plane construction.
( ) 33. The first successful engine driven flights were made in 1903, at Kitty Hawk, N. C., by the Wright Brothers.
( ) 34. Glen Curtis, an American, developed the first plane to take off from the water.
( ) 35. Igor Sikorsky is a pioneer in the building of small planes.
( ) 36. The Sikorsky factory is located in Oswego, N. Y.
( ) 37. Wiley Post's "Winnie Mae" was a biplane.
( ) 38. The U. S. Navy uses many airplanes.
( ) 39. An amphibian aircraft can rise from the water only.

( ) 40. Transport liners have either two or four engines.
( ) 41. Military planes are classified according to the work they have to perform.
( ) 42. A pursuit plane is larger than a bomber.
( ) 43. The China Clipper is the fastest and largest bomber in the U. S. Navy.
( ) 44. The Douglas Aircraft Company is located in Lancaster, Pa.
( ) 45. The Curtiss Wright Aircraft Company is in Buffalo, N. Y.
( ) 46. The Glen Martin Company is located in Ansonia, Conn.
( ) 47. The Consolidated Aircraft Corporation is located at San Diego, Calif.
( ) 48. The Pratt and Whitney Company is located at Hartford, Conn.
( ) 49. The stick is connected to the rudder elevator and ailerons by a stout twisted rope cable.
( ) 50. The stick pushed forward or backward affects only the elevators.
( ) 51. When the pilot pushes on the right rudder pedal the rudder moves to the left.
( ) 52. After the plane picks up speed the stick is pushed forward.
( ) 53. The airplane levels off when the stick is pushed forward.
( ) 54. Each wheel of a plane can be braked separately.
( ) 55. The speed is increased when the throttle is pushed ahead.
( ) 56. A plane will take off when it attains a speed of 15 miles per hour.
( ) 57. The correct way to turn a plane is to bank.
( ) 58. Banking is accomplished by the ailerons which are controlled by the stick.
( ) 59. The *flaps* create a tremendous drag, when used in landing a plane.
( ) 60. To become a plane pilot a student must be physically fit, have quick reflexes, and be courageous.
( ) 61. An Army or Navy pilot requires at least four years of training.
( ) 62. The noncommissioned officers constitute the majority of the military flying personnel.
( ) 63. Flying a plane is taught at West Point, to the students.
( ) 64. Only college graduates are accepted as student pilots by the U. S. military authorities.
( ) 65. An aviation lieutenant receives $625 per month.
( ) 66. Few opportunities occur for promotion in a pilot's career.
( ) 67. The demand for flyers will increase after the war is over.
( ) 68. Commercial pilots take off in good weather only, as a rule.
( ) 69. Flying a plane is a well-paid profession.
( ) 70. An airplane mechanic must present proof as to his reliability, before he can secure a job.
( ) 71. In large aircraft factories it is necessary that a mechanic be an all-round mechanic.
( ) 72. A 21-passenger plane costs $25,000.
( ) 73. The engine in a plane of this size costs $375.
( ) 74. Twenty-five gallons of *gas* will run a large engine on a U. S. bomber for one hour.
( ) 75. A mechanic must be competent to use hand tools in the aircraft industry.
( ) 76. A knowledge of mechanical drawing is necessary, if a mechanic is desirous of being successful.
( ) 77. After completing a repair job, a mechanic must *sign up*, in regard to the work done by him.
( ) 78. The mechanic usually wears a dirty uniform.
( ) 79. The mechanic usually refers to his boss before making a decision in replacing worn or broken parts.
( ) 80. A mechanic desiring work for an airline must have both an airplane rating and an aircraft mechanic rating.
( ) 81. The Civil Aeronautics Board enforces strict regulations regarding airplane mechanics.
( ) 82. Riveting is a common method of joining aluminum alloy.
( ) 83. A standard rivet is used, 3/16 in. in diameter for all airplane construction work.
( ) 84. The one shot pneumatic riveting gun is used on all airplane construction jobs.
( ) 85. All rivets used in airplane construction must be corrosion resisting.
( ) 86. Welds are located at many strategic points on a plane.
( ) 87. The motor mount is a welding job.
( ) 88. Resistance welding is the kind used most extensively in aircraft construction.
( ) 89. A multitude of hand sheet-metal operations are still present in aircraft construction.
( ) 90. The electric sheet-metal former is used extensively for crimping flanges.
( ) 91. The cutters on a milling machine are made of machine steel.
( ) 92. Square stock is held by hand, when drilling holes with the drill press.
( ) 93. The drills used in a drill press all have the same cutting angles.
( ) 94. Aluminum forgings are routed and channeled by a hand process.
( ) 95. The automatic screw machine is one of the most versatile tools in the machine shop.
( ) 96. All planes, commercial and military, require the same number of coats of dope when being finished.
( ) 97. The pigmented dope system is used mostly on military planes.

Key for Test in Airplane Construction

1. F	26. T	50. T	74. F
2. F	27. F	51. F	75. T
3. T	28. T	52. F	76. T
4. F	29. F	53. T	77. T
5. F	30. F	54. T	78. F
6. T	31. F	55. T	79. F
7. T	32. T	56. F	80. T
8. T	33. T	57. T	81. T
9. T	34. T	58. T	82. T
10. F	35. F	59. T	83. F
11. F	36. F	60. T	84. F
12. F	37. F	61. F	85. T
13. T	38. T	62. F	86. T
14. F	39. F	63. T	87. T
15. F	40. T	64. F	88. F
16. F	41. T	65. F	89. T
17. F	42. F	66. F	90. T
18. T	43. F	67. T	91. F
19. T	44. F	68. T	92. F
20. T	45. T	69. T	93. F
21. T	46. F	70. T	94. F
22. F	47. T	71. F	95. T
23. T	48. T	72. F	96. F
24. F	49. F	73. F	97. F
25. F			

TEST FOR STUDENTS OF PRINTING

R. RANDOLPH KARCH

Principal, The Printing High School
Cincinnati, Ohio

Writing and Publishing. Unit 2 — Mastery Test

Match the correct definition on right with the word at left.

1. Add	*a*) First edition of a morning paper.
2. Advance	*b*) News and feature material in plate form.
3. Agate	*c*) Almost the same, side by side.
4. Bank	*d*) Section of a headline.
5. Banner	*e*) Routine news assignment.
6. Beat	*f*) Story received too late for writing up.
7. Boil	*g*) More information to be included.
8. Boiler plate	*h*) Measurement for depth of advertisements.
9. Bumped heads	*i*) Story presented ahead of release time.
10. By-line	*j*) Large headline extending across page.
11. Bulldog	*k*) Writer's signature on a story.
12. Bulletin	*l*) To condense greatly.
13. Canopy head	*a*) Head with two or more lines indented right.
14. Chapel	*b*) Three or four deck head, with subordinate heads dropping from left and right.
15. Chaser	*c*) Subordinate bank or deck in a head.
16. Clip sheet	*d*) Group of union mechanical employees.
17. Cut lines	*e*) Device used to separate advertisements.
18. Crossline	*f*) Time for cessation of copy acceptance.
19. Cutoff rule	*g*) Same as bank.
20. Dead line	*h*) Corrections or new matter to replace others.
21. Deck	*i*) Single line occupying full measure.
22. Dogwatch	*j*) Syndicated collection of copy.
23. Drop	*k*) Assignment outside publishing hours.
24. Drop line head	*l*) Identifying illustration lines.
25. Ear	*a*) Continued story headline.
26. Exclusive	*b*) Press agent copy.
27. File	*c*) Space left in form for late news.
28. Flag	*d*) Dash used between headline decks.
29. Flash	*e*) Reporters' gallery.
30. Folo	*f*) Type matter to sides of name plate.
31. Fourth Estate	*g*) Dummy.
32. Fudge	*h*) Statement of ownership.
33. Format	*i*) Story related to larger one but following.
34. Handout	*j*) Used in place of *scoop*.

35. Jim dash	*k*) Short wire message breaking in.
36. Jump head	*l*) Transmit a story by wire.
37. Lead all	*a*) Reference library.
38. Leg man	*b*) Shift outside publication hours.
39. Lead	*c*) Explanatory titles under cuts.
40. Leader	*d*) Story not complete.
41. Legend	*e*) Changes on pages for replating.
42. Lobster trick	*f*) General summary.
43. Logotype	*g*) Name plate of newspaper.
44. masthead	*h*) General assignment reporter.
45. Must story	*i*) Same as flag.
46. Make over	*j*) First paragraph of news story.
47. More	*k*) Story ordered to be inserted.
48. Morgue	*l*) Best displayed story on page 1.
49. Overbanner	*a*) Type set in excess of needs.
50. Overline	*b*) To emphasize by heading.
51. Overset	*c*) Wire message asking if story is wanted.
52. Patent insides	*d*) Headline above name plate.
53. Play up	*e*) Same as patent insides.
54. Predate	*f*) Date news may be used.
55. Query	*g*) Plates with usual black parts white.
56. Railroad	*h*) Type at top of illustration.
57. Ready print	*i*) Continued on another page.
58. Release	*j*) Already printed pages.
59. Reverse plates	*k*) Unedited or unproofread matter.
60. R.O.	*l*) Edition run today with tomorrow's date.
61. Running head	*a*) Flush heading.
62. Sacred cow	*b*) Overbanner.
63. Sidehead	*c*) Stories of immediate happenings.
64. Sky-line streamer	*d*) Name and date at top of each page.
65. Slug	*e*) Multiple deck head, not full page width.
66. Spot news	*f*) Person receiving editorial favor.
67. Spread head	*g*) Banner.
68. Stagger head	*h*) Simple, terse style.
69. Straight news	*i*) Drop line head.
70. Streamer	*j*) Printers' directions with type.
71. String	*a*) Section of copy.
72. Sub	*b*) Crowded with ads.
73. Take	*c*) Same as name plate.
74. Thirty	*d*) Bumped heads.
75. Tight	*e*) Day's work on machine.
76. Title line	*f*) News in center with ads to bottom and sides.
77. Tombstone heads	*g*) News space greater than normal.
78. Well make-up	*h*) Short line at top of column.
79. Wide open	*i*) End of copy or day's work.
80. Widow	*j*) One not employed showing up for work.

Problems and Projects

ROTARY MILLING TABLE

WILLIAM A. DeVETTE

Technical High School
Erie, Pa.

(See assembly and details on pages 24 and 25)

A rotary milling table which may be built by the students in the machine shop will be found to be a welcome piece of shop equipment.

Such a table is shown in the drawings in the form of a drafting room project. As it involves worm gearing it should be assigned to advanced students only. The completed turntable is used with a standard dividing headplate and its use should form a part of the associated information included with the development of the drawings.

The perspective assembly and details only are given so that the instructor may assign the project in any manner he wishes, either in whole or in part according to the individual abilities of the students.

When the drawings have been completed the project may be routed through the school shops for construction.

The table as shown in the 12-in. size, and another in the 16-in. size were made in our school shops and are now in service.

The project is also excellent for the War-Production Training Program toolmaking classes.

JIGS FOR MAKING U. S. NAVY PLANE MODELS

R. A. RADTKE

Supervisor of Industrial Arts
Milwaukee, Wis.

Planes, planes, planes, and still more planes! That is the cry of Uncle Sam. Uncle Sam wants good planes, well made, and accurate throughout. He wants quality as well as quantity. This statement formerly applied to the aircraft industry only, but now it applies equally well to the industrial-arts departments of the schools that make model airplanes for Uncle Sam.

With a suddenness which caught most of us unawares, for few individuals had advance knowledge of the exact nature of this project, teachers and supervisors alike found themselves confronted with a model-airplane building program of great magnitude and real significance. It was obvious from the beginning that adjustments in our school program would have to be made, and that department heads, teachers, and pupils could not continue work as usual. Department heads would have to plan the best method of procedure in meeting the quotas which had been established for the local communities, co-ordinate the work of the different schools, appoint the inspection committee, and perform a multitude of other duties. Teachers would have to plan, co-ordinate, and execute the work within their schools; while pupils would have to discard, at least temporarily, the projects upon which they were working, to enter upon this more urgent project of building model planes for the U. S. Navy.

The situation in the smaller communities

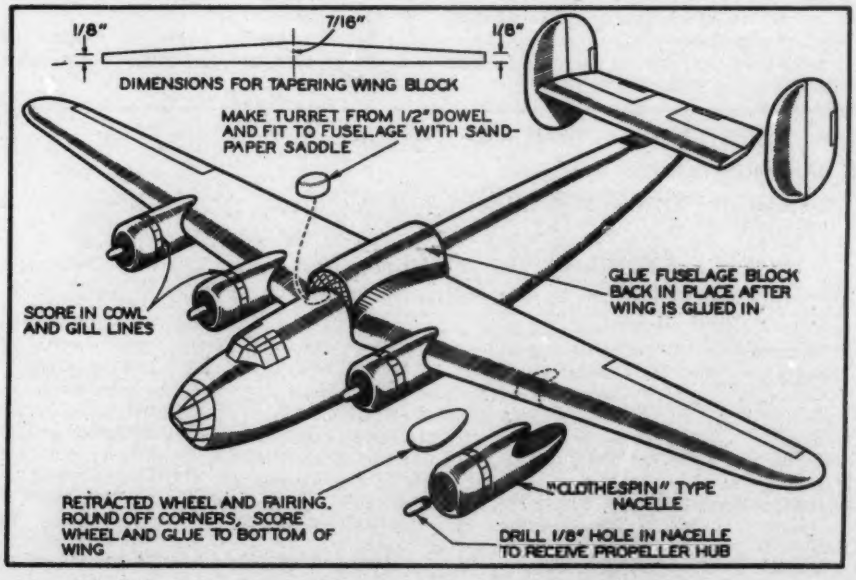

1/8"
7/16"
1/8"
DIMENSIONS FOR TAPERING WING BLOCK
MAKE TURRET FROM 1/2" DOWEL AND FIT TO FUSELAGE WITH SAND-PAPER SADDLE
GLUE FUSELAGE BLOCK BACK IN PLACE AFTER WING IS GLUED IN
SCORE IN COWL AND GILL LINES
RETRACTED WHEEL AND FAIRING. ROUND OFF CORNERS, SCORE WHEEL AND GLUE TO BOTTOM OF WING
"CLOTHESPIN" TYPE NACELLE
DRILL 1/8" HOLE IN NACELLE TO RECEIVE PROPELLER HUB

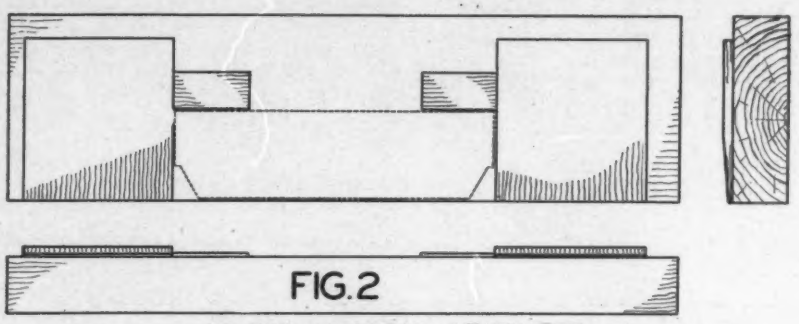
Fig. 1. Consolidated B–24D U. S. Army Bomber

was not unlike that in the larger cities, for all of us had to make adjustments in our programs. It was not a question so much of what we should do, but rather of how best we could do this job. Decisions had to be made and plans of procedure adopted and put into effect.

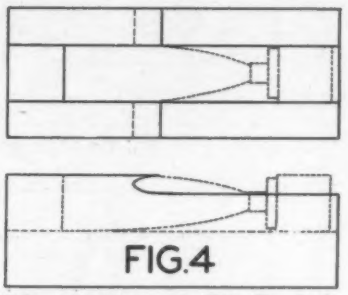
In Milwaukee the production method was adopted not for its expediency only, but for its educational and vocational value as well. To us it is just as important for an individual to learn the methods of industry and become acquainted with the society in which he will live and work, as it is to develop individualism through independent effort. Besides, there is nothing in our plan that prevents an individual from making the individual planes if he so chooses. The opportunities of personnel organization, shop management, working on duplicate parts, and rotating through the various parts, offer varied experiences. However, the possibilities of the group working on all fifty models is remote, and in our case we assigned only two or three models to each of the 17 high schools participating in the project.

The greatest benefit that can be gained from this method is in the jigs and fixtures that can be developed in constructing and assembling these model planes. Some of the jigs and fixtures developed by some of the teachers were rather ingenious devices and exemplified a high degree of craftsmanship and skill. Most of the jigs were made out of the simple materials found in any woodshop, and one wonders if the by-product of their development is not technical skills of the greatest value.

The jigs and fixtures shown in Figures 2 to 7 inclusive were developed under the direction of Mr. Irwin C. Martin, instructor of woodwork at West Division High School, Milwaukee. They were used in constructing the



JIG FOR PLANING STABILIZER



JIG FOR MAKING CUTOUT ON NACELLES TO FIT WINGS

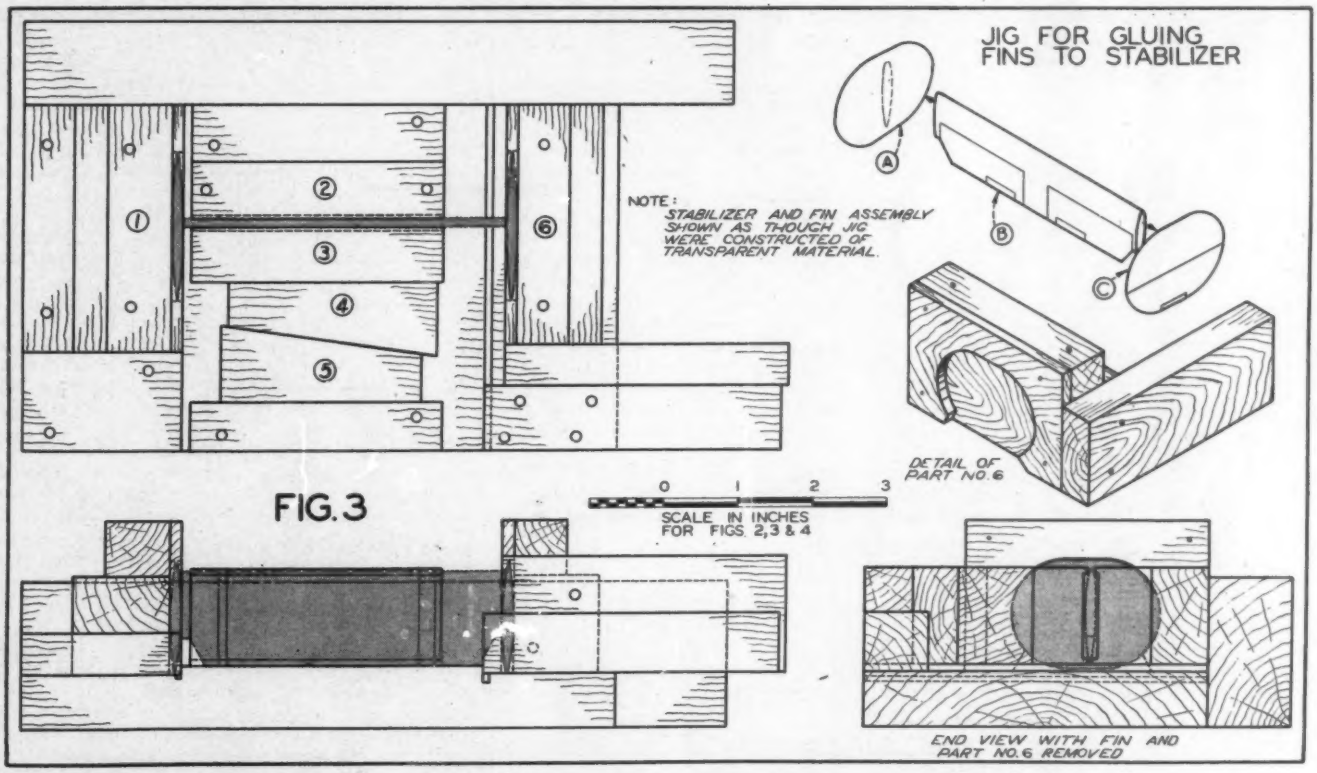

JIG FOR GLUING FINS TO STABILIZER
NOTE: STABILIZER AND FIN ASSEMBLY SHOWN AS THOUGH JIG WERE CONSTRUCTED OF TRANSPARENT MATERIAL.
DETAIL OF PART NO. 6
FIG.3
SCALE IN INCHES FOR FIGS. 2,3 & 4
END VIEW WITH FIN AND PART NO. 6 REMOVED

Fig. 2. Jig for planing stabilizer

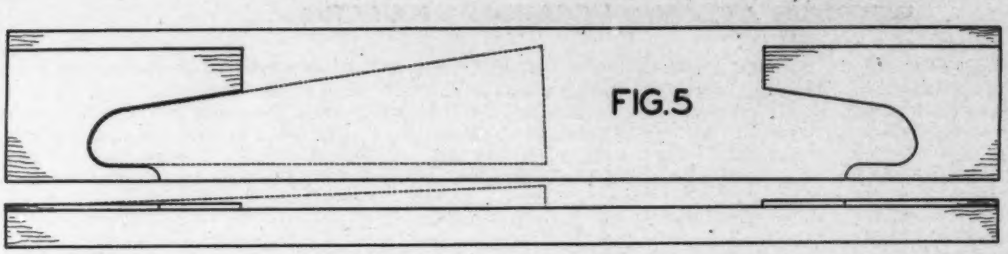
Birch was used for this stabilizer. The wood is held in place for planing in the device shown here.

Fig. 3. Jig for gluing fins to stabilizer

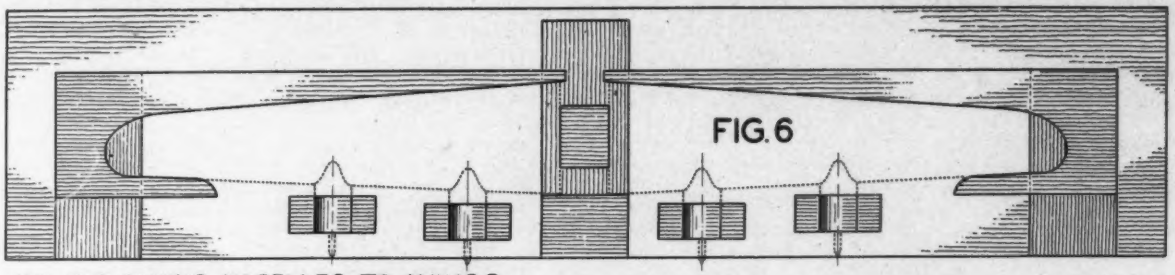
To use this jig place fin A in part No. 1 of jig. Then apply glue to two ends of stabilizer B, place it against part 2 of jig, pushing it against fin A at the same time. Then drop part 3 of jig in place, and clamp it with wedges 4 and 5. Next place fin C in part 6 of jig, put the latter in place, and push it forward so that fin C is brought firmly against the stabilizer. Stabilizers and fins put together in this manner will always be assembled properly.

Fig. 4. Jig for making cutout on nacelles to fit wings

This device, if well made, will save lots of time. The engine nacelle must fit snugly between the sides of the jig. The sawing can then be done with great accuracy.



JIG FOR PLANING RIGHT & LEFT-HAND WINGS



JIG FOR GLUING NACELLES TO WINGS

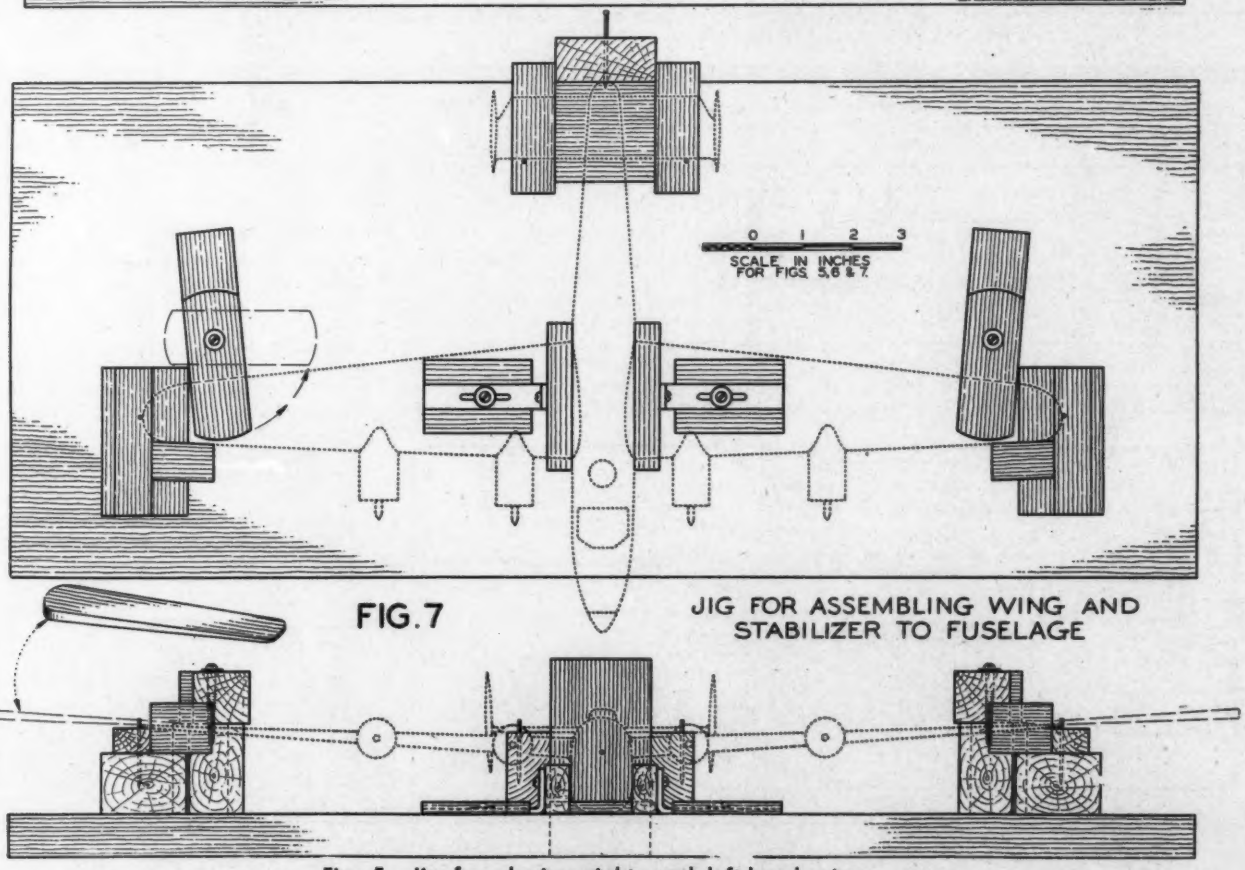


FIG.7

JIG FOR ASSEMBLING WING AND STABILIZER TO FUSELAGE

Fig. 5. Jig for planing right- and left-hand wings

The wings are held firmly in this device and can be planed safely and uniformly to size. This device has right- or left-hand stops.

Fig. 6. Jig for gluing nacelles to wings

The purpose of this jig is to glue the engine nacelles into position on the wings before attaching wings to fuselage. If the nacelle cutouts have been made properly, the fitting will be a simple matter. These wing assemblies are made ready for the final assembly jig, shown in Figure 7, thus saving much valuable time.

Fig. 7. Jig for assembling wing and stabilizer

The fuselage is put into place first. The nail in tail end holds it from raising or lowering. Next the wings with nacelles already fastened on are put into place. They are glued and nailed into position. The final part of fuselage covering the wings is glued into place and carved to shape. The tapered blocks fit over the ends of the wings as a means of protection, and to hold wings snugly into position. The tail assembly piece is then glued and nailed into position.

Consolidated Bomber B–24. The complete set consists of six different jigs, each designed for a specific function. With jigs of this kind one should have no rejected model planes.

Figure 2 shows a device for planing the stabilizer; Figure 3, for gluing the fins and stabilizer together; Figure 4, for sawing out the nacelles to fit the wings; Figure 5, for planing the wings to the proper thickness; Figure 6, for gluing the engine nacelles to the wings; and Figure 7, for the final assembly.

Needless to say, Milwaukee completed its quota of planes last spring and got them to the receiving centers on time. In general, the planes were all very good pieces of craftsmanship. They were not approved unless they passed the inspection of the inspection committee. This committee was in charge of Mr. Alex Hanel, instructor of patternmaking at Boys' Technical High School. This committee performed its duties so well that the U. S. Navy rejected very few of the planes submitted.

There is one other factor which may be helpful. In laying out the parts of the plane we used metal templates wherever possible. These templates were made in the metal-working departments in the various high schools. Thus, the metal-working departments also had a part in this project.

Pattern Pine No. 1 Shop was used wherever and whenever available. Some of the tail assembly parts, such as rudders or fins, occasionally were made of birch or mahogany.

In finishing the models we experimented with three different finishes — black shellac, lacquer, and No. 54–98 flat black varnish procured from the Pittsburgh Plate Glass Company. This latter finish proved most successful because it set very quickly, evenly, and did not streak. Even the worse dauber could not do a poor job with it.

Most of the fillets were made of plastic filler made by the Gill Products Company, Cudahy, Wis. Here again this material proved very satisfactory, because if kept sufficiently moist it could be worked into shape very nicely, did not shink, and took the finish uniformly with the rest of the plane.

The scorings on the models were burnt into the wood with a small electric burning iron. It was the usual practice to do this scoring before the finish had been applied.

There are great possibilities in building these model planes to plan lessons of interest which will correlate with your handwork. The airplane and flying is a young man's game and usually topics found in current magazines and the abundance of literature coming off the press will interest him in building the models. One can pick up any one of the models and tell an interesting story about it. As a matter of fact, in many instances our pupils are up on their plane knowledge, history, and abilities better than most adults.

One of the most important lessons we can teach is plane nomenclature and recognition. What boy by now doesn't know the Flying Fortress, the Curtis P–40, the Lockheed P–38, and so on? But the important thing to tell him is the number of planes cadets must learn to recognize before passing from preflight to flight school, and then he begins to take plane recognition talk real seriously.

We are building a future America which will travel greater distances than the automobile of this generation has carried us.

EFFECTIVE AERODYNAMICS DEMONSTRATION

ARTHUR A. DICK

Chairman, Industrial Education Dept.
Sparrows Point High School
Baltimore County, Md.

With the introduction of preflight aviation, and other courses for students in our schools, has come the increased need for effective demonstration in teaching procedure. Proper demonstrations will make a transition from abstract fundamentals to real and practical applications.

The effective demonstration should be as *simple* as possible; *short*, yet complete; *vivid* for retention; and *practical* of application.

Demonstrations require careful preparation with a definite purpose in mind. Materials should be readily obtainable. The experiment should be easy to perform by the instructor or by the student. The application should be direct. The impression of a demonstration lasts longer than by merely telling, and the principle is more easily grasped.

The following is an example of a type of demonstration which can meet the conditions of the previous hypothesis.

An Experiment in Aerodynamics

Purpose. Demonstrating the lift of an airplane wing by Bernoulli's principle.

Introduction. The demonstration presented is a simple and productive method of explaining to students the principle on which the lift of an airplane wing is based. Materials are easily obtained and the performance of the experiment is relatively simple. Even the student can perform it with ease.

Prepare the students for the demonstration by a suitable explanation, but do not give them the reasons for the effect of the demonstration. That is, tell them what is going to take place, but not why. Many students may be dubious about the success of the experiment, but the performance will convince them.

Perform the experiment to the group, and then by a questioning process gather through group discussion the reasons why the experiment works, and also indicate the practical application to the airplane wing. Diagrams on the board at this point will be of help.

Procedure. The materials needed are a small spool, a stiff card about 2½ by 2½ in., and a common pin. See Figure 1.

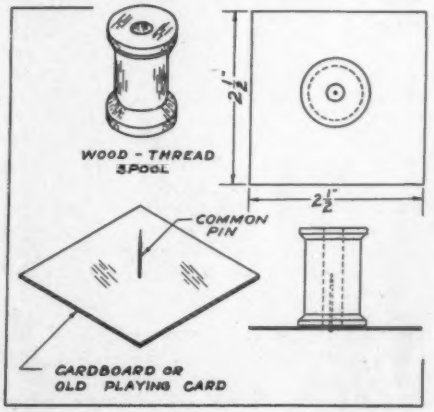


Fig. 1

1. Push the pin through the center of the card.

2. Place the pin in the hole at one end of the spool so that the card is flush with the end of the spool. The reason for the pin is to keep the card centered on the spool. See Figures 1 and 2.

3. Grasp the spool between the thumb and index fingers with the right hand being careful not to touch the card. With the left hand hold the card in position on the bottom of the spool.

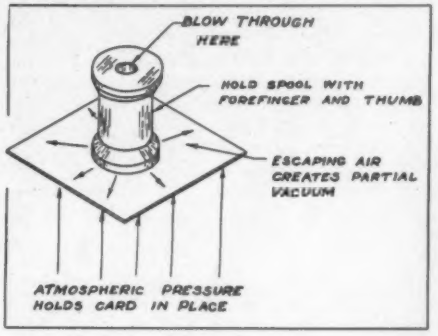

BLOW THROUGH HERE
HOLD SPOOL WITH FOREFINGER AND THUMB
ESCAPING AIR CREATES PARTIAL VACUUM
ATMOSPHERIC PRESSURE HOLDS CARD IN PLACE

Fig. 2

4. Bring the other end of the spool to the mouth and commence blowing through the spool. As soon as the blowing starts, the left hand, supporting the card, can be removed from its supporting position, and the card will stay in place. See Figure 3.

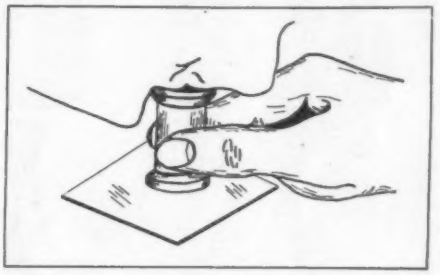


Fig. 3

5. The harder one blows the tighter the card presses against the bottom of the spool.

Solution. Blowing through the spool creates a flow of air over the surface of the card, thus creating a partial vacuum. The atmospheric pressure from below the card tends to force the card up because the pressure on top of the card is less than the pressure below.

Showing how can be more effective than telling how.

The ability to deal with spatial relations, rapidly and accurately, has been shown to be the prerequisite and basis for training and working in such jobs as are held by the designer and draftsman, the architect and sculptor, the dentist, physician and surgeon, the watchmaker and expert mechanic.

— John Edmund Crawford

Vocational guidance is the process of assisting the individual to choose an occupation, prepare for it, enter upon and progress in it.

— National Vocational Guidance Association

FORGED HUNTING KNIFE

N. H. POOLE

Emmerich Manual Training High School

Indianapolis, Ind.

Many boys of high school age like to hunt and fish, and if they are enrolled in shop courses, they like to make articles that will be useful to them. A hunting knife, to them, fills the requirements.

It is the purpose of this article to stress forging and heat-treating procedures, using the hunting knife as a teaching aid. By varying the materials and procedures, any other tool project, such as a small riveting hammer, cold chisel, hunting ax, and the like, may be used to serve the same purpose. The materials, sizes, and procedures referred to have been found to be satisfactory, but it is possible to make changes according to the wishes of the student and instructor.

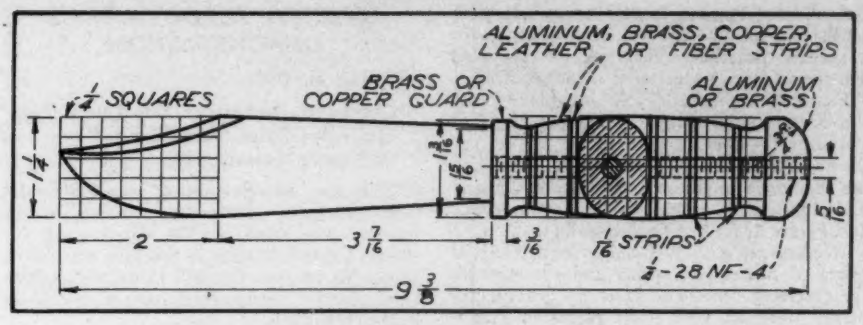


Fig. 1. Details of the knife

Figures 1 to 14 show the step-by-step procedure which must be followed in making the hunting knife, thus eliminating a great amount of descriptive material. Each illustration should be studied since it represents a definite step.

If new material is used, select water hardening carbon tool steel with a carbon content of from .85 to 1.10 per cent. This kind of steel, after proper forging and heat-treating, has a fair degree of toughness and hardness, and holds a good cutting edge. Each knife requires a piece of annealed carbon tool steel ¼ by 1¼ by 9 in.

Make a cardboard or tin pattern of the blade. Transfer the pattern onto the steel with a center punch. See Figure 2.

Forge the steel for the knife at a medium cherry red color or about 125 deg., as shown in Figure 3. Never cool the blade in water during the forging processes. It is good to hammer steel as it helps to refine the grain, but do not let the steel soak in the fire as this destroys some of its properties.

With the top and bottom fullers, notch in for the handle as shown in Figure 4.

Now cut away the extra metal from the handle with the hot cut chisel. Also cut the blade to shape. See Figure 5.

Next use the top and bottom swages, as shown in Figure 6, and shape the handle round.

After forging the metal should be normalized. Heat it to 1500 deg. F., a full cherry red and let it cool in still air. The purpose of this is to break up the course jagged structures obtained in forging and to produce a finer grain with a more uniform structure. See Figure 7.

The next step is to rough-grind the blade to shape. Begin grinding at the back of the blade and grind toward the cutting edge. Grind the same amount off of each side. Grind the handle to 5/16 in. round. See Figure 8.

Square up the back end of the blade. Thread the handle with a 5/16-in. 24 N.F. die, as shown in Figure 9.

For hardening, heat the blade in a 10-in. piece of 2½-in. pipe. The pipe serves as a muffle and protects the blade from the direct flames of the fire. Heat the blade in the pipe muffle to between 1380 and 1450 deg. F., or a bright cherry red. See Figure 10. When plunging the heated blade in the water, immerse the back of the blade first to prevent warpage. Always harden on a rising temperature.

Next draw the temper by heating to about 450 deg. F. The temper colors will be brown with purple dots. Drawing the temper relieves strains set up in hardening and adds toughness. A good method to follow in tempering tools is to heat a cast iron block red hot and lay the tool on the hot metal. Some of the heat will be absorbed by the tool and soon temper colors will be seen. With the *buff* stick, which consists of a piece of wood to which a piece of abrasive paper or cloth has been fastened, rub off the scale and watch for the proper

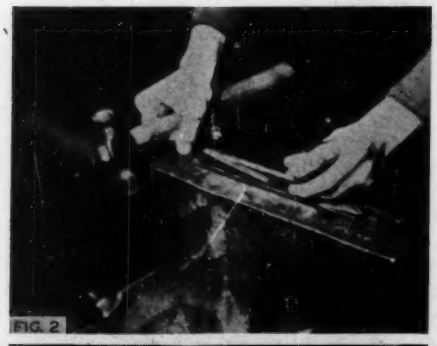


FIG. 2

FIG. 3

FIG. 4

Fig. 2. Transferring the pattern to the steel
Fig. 3. Forging the steel to shape
Fig. 4. Using the fullers to produce the notches for the handle

FIG. 5

FIG. 6

FIG. 7

Fig. 5. Cutting the blade to shape
Fig. 6. Swaging the handle round
Fig. 7. Normalizing the steel

FIG. 8

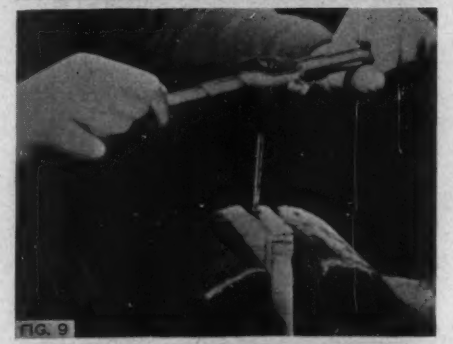


FIG. 9

FIG. 10

Fig. 8. Rough grinding
Fig. 9. Cutting the threads on the handle
Fig. 10. Hardening the blade

temper colors. When the brown with purple dots appears quench in water. See Figure 11.

Schools which have a pyrometer can check forging, hardening, and tempering temperatures without watching for heat colors. Figure 7 shows the pyrometer in use.

The handle is made from scraps of such metals as brass, copper, aluminum, or stainless steel. Red, white, and black fiber or leather can also be used. Pieces are cut 1 by 1½ in. from stock that is ⅜ or ¼ in. thick. Drill ¼-in. holes, 1/16 in. above center, in each piece of material. Tap with a 5/16-in. 24 N.F. tap. Assemble the handle by screwing the parts tightly together. A hand clamp makes a good wrench for this job. To protect the blade from vise marks cover the jaws with wood blocks, as shown in Figure 12.

After the handle is assembled cut off the corners with a hack saw. Finish shaping the handle by grinding. Do not permit the grinder wheel to become loaded with leather, brass, or aluminum, but use a wheel dresser and keep the wheel clean and sharp so that it will cut fast and not cause overheating of the handle. It is very important that goggles be worn during all grinding operations.

Set up a canvas buffing wheel with No. 220 grinding compound. This is done by coating the buffing wheel with wood glue and rolling it in a pan of the compound. Let dry for 24 hours. Polish the blade and handle on this abrasive buffer, holding the blade as shown in Figure 13.

After the blade has been whetted it should be polished on a canvas buffing wheel, using rouge for the cutting compound.

Wash the blade and handle with lacquer thinner and give the entire knife a thin coat of clear lacquer.

Figure 14 shows a few variations that can be made in the design of the knife to suit individual tastes.

The hunting knife can also be made from an old file if tool steel is not available. Before an old file can be used it must be annealed. Since files are hardened at various heat ranges it is best to find the annealing heat by heating to first about 1200 deg. F. (a dull red). Let the file cool very slowly in the heat-treating furnace or bury it in ashes in the forge. If the file is still hard after it cools, reheat it to about 1300 deg., and let it cool slowly. Continue this until the temperature is found at which the file is left soft. After the file has been annealed the same steps are followed as those for using new tool steel.

PROJECTS FOR THE BLIND

Will some shop instructor help out Russell Richard, who is shop instructor at the Overbook School for the Blind, 64th and Malvern Avenue, Philadelphia, Pa.? He is desirous of obtaining projects simple enough for his blind students.

Realizing that it is economically unsound to train boys for any vocation unless they can be placed there, the teacher of vocational subjects should keep in mind opportunities for each boy for ultimate placement. — *The Michigan Program for Vocational Education*

FIG. 11

FIG. 12

FIG. 13

Fig. 11. Drawing the temper
Fig. 12. Assembling the handle
Fig. 13. Polishing the blade

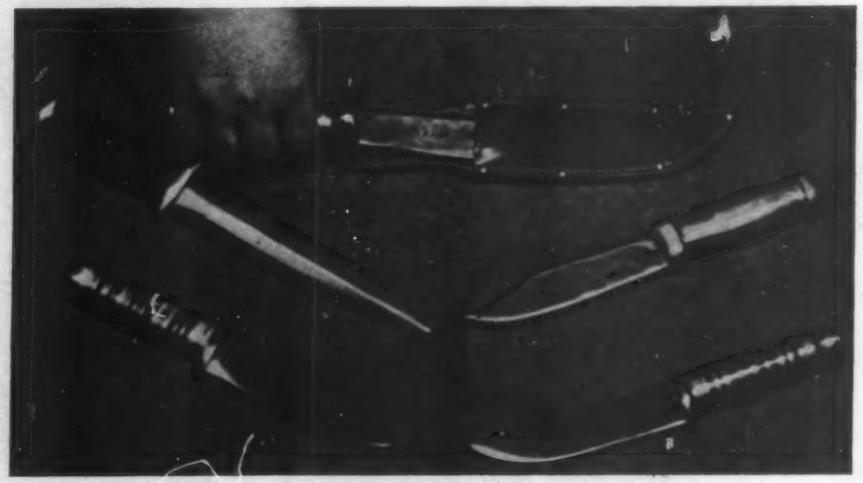


Fig. 14. Some knives made in the author's classes

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT

Hales Corners, Wis.

(*Continued from page 440 of the December, 1942, issue.*)

After whittling birds, animals, totems, katcinas, and the like, it is only natural that we should try our hand at whittling the human face and figure. Probably the simplest face to try first would be a mask, such as the one shown in Figures 105 and 106. Masks are made by both primitive and educated people for dancing costumes and for decorative purposes. The one shown in Figure 105 is of the

Fig. 105. Iroquois mask

type made by the Iroquois Indians. It is rather simple and at the same time interesting. These masks vary in size from the one shown in Figure 105, to dance masks 12 or more inches in height. A good sharp small blade is required and fine-grained softwood.

Small masks can be used for lapel ornaments. When made about 5 inches high they can be used for book ends, or one can make them natural size and use them for wall hangings.

The little peasant man shown in Figures 107 and 108 offers a little more interesting job. It is whittled with a minimum of cuts, which the author has tried to show in his drawings. If your knife is razor sharp and your wood is close grained, you will be surprised what a single cut will do to the figure.

Fig. 106. Iroquois mask and Indian neckerchief slide

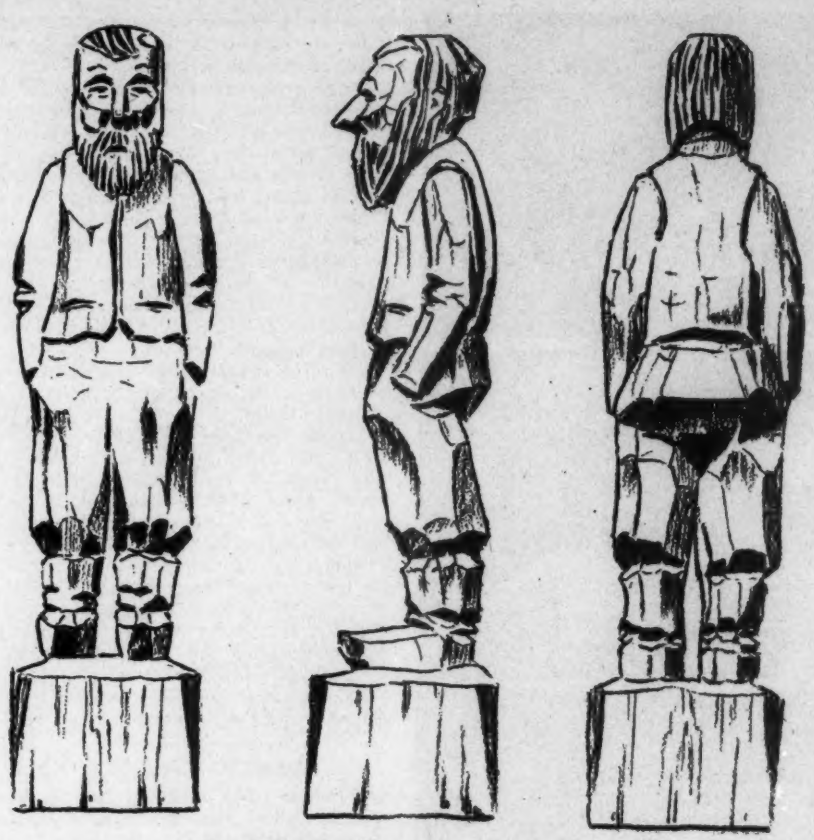


Fig. 107. Small statue of a peasant

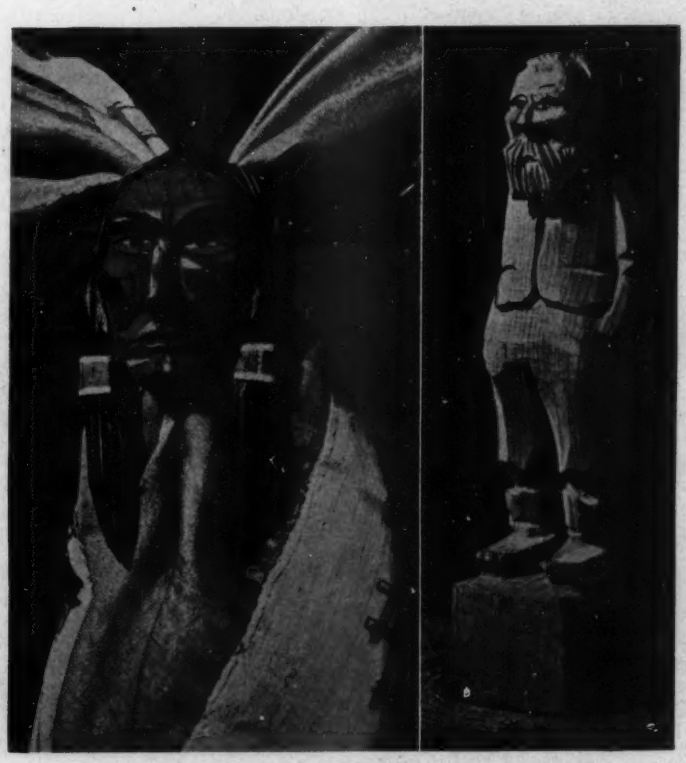


Fig. 108. Neckerchief slide and peasant statue

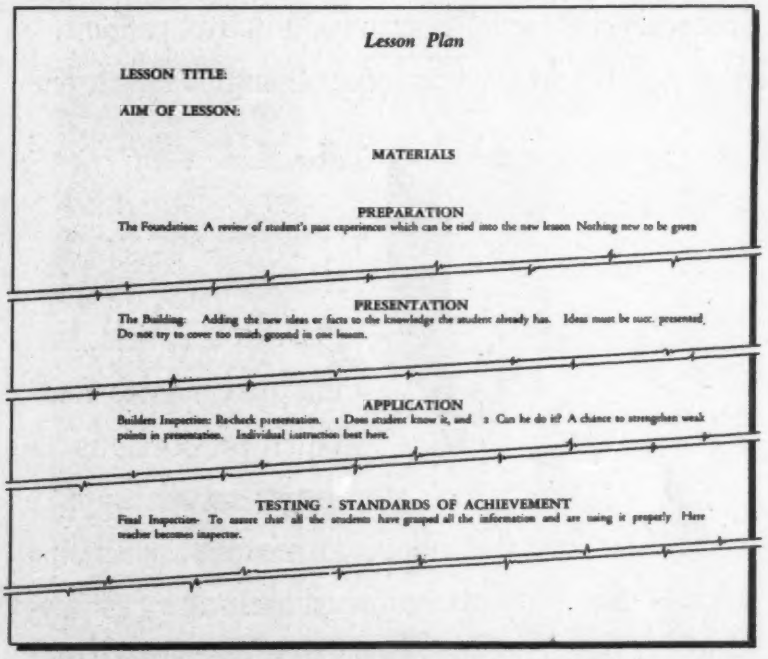
And when you finish whittling, color it with thin water-color paints. For this figure, color the hair and beard white, the face flesh or pink with a little red on the cheekbones, and a bit of pink at the mouth. The vest is brown, shirt sleeves green, pants light gray, and boots dark gray with a little brown mixed in.

Fig. 109. How to carve the Indian-head neckerchief slide

Neckerchief slides of various kinds were shown on pages 38 and 39 of the January, 1942, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. This month the rather more difficult slide shown in Figures 106, 108, and 109 is presented. This Indian-head neckerchief slide, when painted, is very attractive. In whittling faces like these, study the drawings carefully before cutting, especially after the rough cutting and forming is done. Even the simplest face is rather tricky, as every cut tells a story. So take it easy, study the drawings, and study each cut until you know what it will mean in the finished work. You can't put it back once it is cut away.

This neckerchief slide should be painted. The face, a nice Indian red, lips a brighter red, eyes black, hair black, and the hairband red. Use water-color paints. Give the face a thin coat of shellac and the hair several coats to give a glossy appearance. Leave the inside of the slide unfinished and slightly rough to prevent slipping.

The Indian head may also be used as a lapel ornament.



Lesson Plan

LESSON TITLE:

AIM OF LESSON:

MATERIALS

PREPARATION

The Foundation: A review of student's past experiences which can be tied into the new lesson. Nothing new to be given

PRESENTATION

The Building: Adding the new ideas or facts to the knowledge the student already has. Ideas must be succ. presented. Do not try to cover too much ground in one lesson.

APPLICATION

Builders Inspection: Re-check presentation. 1 Does student know it, and 2 Can he do it? A chance to strengthen weak points in presentation. Individual instruction best here.

TESTING - STANDARDS OF ACHIEVEMENT

Final Inspection- To assure that all the students have grasped all the information and are using it properly. Here teacher becomes inspector.

A lesson plan which has been found useful. Leonard E. Schmidt, Lincoln Hall Vocational School, Lincolndale, N. Y., and Printing Trades Evening School, New York City

METAL FOR THE SHEET-METAL SHOP

E. LeROY LONGLEY

Baltimore Polytechnic Institute
Baltimore, Md.

Every teacher of sheet-metal work is troubled by the question, "Will I be able to get sheet metal for my work?" Tin, as we all know, is on the priority list, and schools come after the government in priority number, and that will, no doubt, be far down the list.

A help to these teachers is a source of material from the cafeteria of the school. Most modern schools have their own cafeteria kitchen and do their own cooking, and much of the food is taken from cans. The most commonly used can is the number 10 size. This can, if cut and flattened, will produce a piece of tin plate about 6 by 15 in. This size material can be used for many projects, and some of those projects, too large to fit, can be reduced in size to fit.

Fig. 1. Removing the can bottom

Fig. 2. Slitting the side of the can

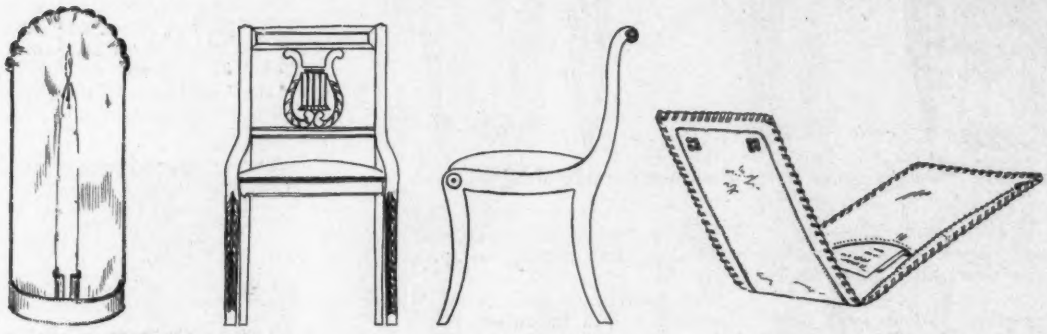
In the author's class, several boys have volunteered to carry out the duty of securing cans from the cafeteria on Wednesday and Friday of each week. The cans are brought to the shop in crates, usually about 30 on each of the two days. Our cafeteria is very cooperative and rinses the cans before they are brought to the shop.

Next, a salvage crew goes into action. The first operation is to take off the bottoms with a regular bench-type can opener, as shown in Figure 1. Next, the side of the can is cut from top to bottom along the edge of the seam. See Figure 2. It will probably take the services of two boys for this operation to keep up with the one bottom cutter. This

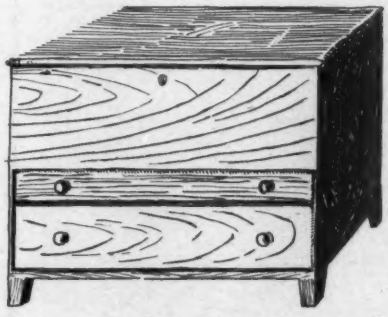
(Continued on page 42)

WHAT IS GOOD PROPORTION?

What proportions are good? Should articles be tall, wide, or square? The answer is implied in the old fable of the crane and the fox each of whom served the other food in dishes designed for his own mode of eating. Which is to say that there is no *right* proportion apart from the conditions of optimum use of the article.



The colonial candle sconce would appear to be very tall for its width, were it not that this shape provides reflection and wall protection for the entire length of the candle. Duncan Phyfe's dining chair is almost a cube at seat height, because of the requirements of fitting the measurements of the seated human body in erect position. Since paper money is of a fixed size, a billfold is much longer than it is wide to conform to the needed shape.



Shaker Blanket Chest

Similarly, the proportions of the several parts of an object are determined by the balance of two forces: (1) securing the optimum service from each part and, (2) adjusting the size & shape of each part to the whole article. In the final analysis no other proportions prove satisfactory.

Certain historic styles depart, at times, from this rule of the analysis of function to secure effects of balance or order. Such proportions are oft attained by employing subtle ratios of length and width (e.g. 1: 1618). These ratios inherently have no special merit, and, unless used with skill, may actually interfere with good design.

Plate 10. Continuation of design course by Burl N. Osburn, Director of Industrial Arts, State Teachers College, Millersville, Pa.

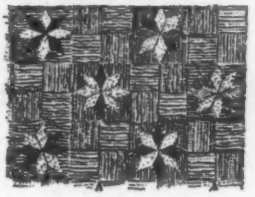
HOW IS ORNAMENT USED?

Ornament is any planned modification designed to increase interest and significance as distinct from the minimum structural or mechanical requirements. The mechanical function and the securing of interest may blend into a coherent plan, or the decoration may be obviously an addition.

Method of Treatment

Brass Door Knocker
Naturalistic

Early Watermark
Symbolic



American Hooked Rug
Geometric

Method of Use

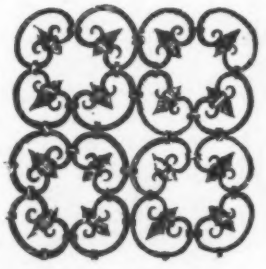
Linotype Border after Jenson
Naturalistic Band

New Years Card, Netherlands
Band of Lettering

Ornament from "magic square", Bragdon
Geometric Band

Modern Book Jacket
Naturalistic All-over Repeat

Ornamentation develops from the literal reproduction of objects of nature, the imaginative variation of these figures, and in the logic of straight line, circle and more complex curves



Wrought Iron Grill, European
All-over Geometric Repeat

It may be used in bands (either continuous or broken); all-over patterns (diaper or powdering); and in radial form, either in two or three dimensions.

Indian Basket
Radiating Pattern

An accurate knowledge of historic ornament is necessary for the designer who wishes to work in any of the so-called "periods" of historic style.

Plate 11. Design course by Burl N. Osburn, Director of Industrial Arts, State Teachers College, Millersville, Pa.

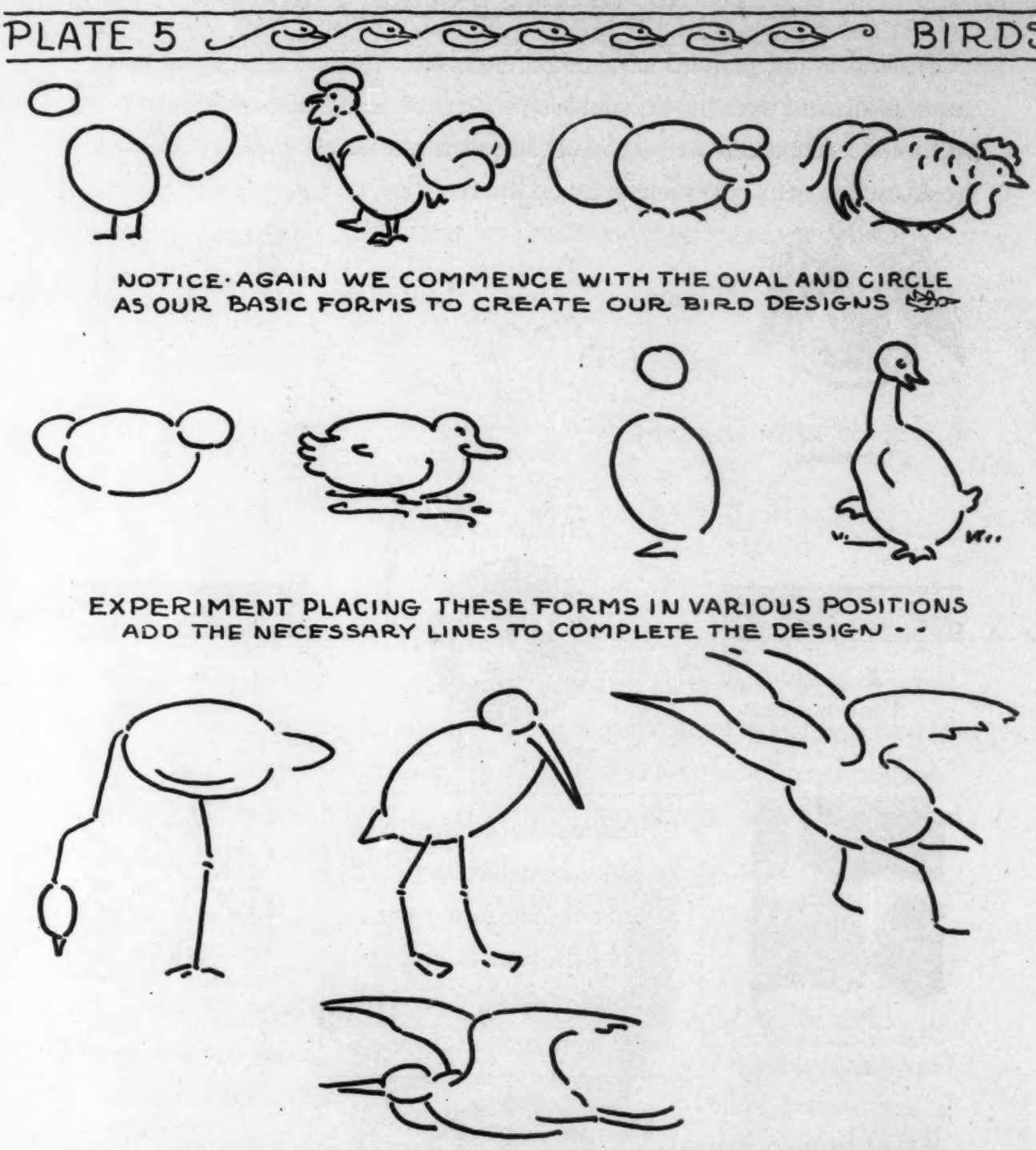


PLATE 5
BIRDS
NOTICE · AGAIN WE COMMENCE WITH THE OVAL AND CIRCLE AS OUR BASIC FORMS TO CREATE OUR BIRD DESIGNS
EXPERIMENT PLACING THESE FORMS IN VARIOUS POSITIONS ADD THE NECESSARY LINES TO COMPLETE THE DESIGN - -
PRACTICE MAKES PERFECT – KEEP ON TRYING

Plate 5. Continuation of creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

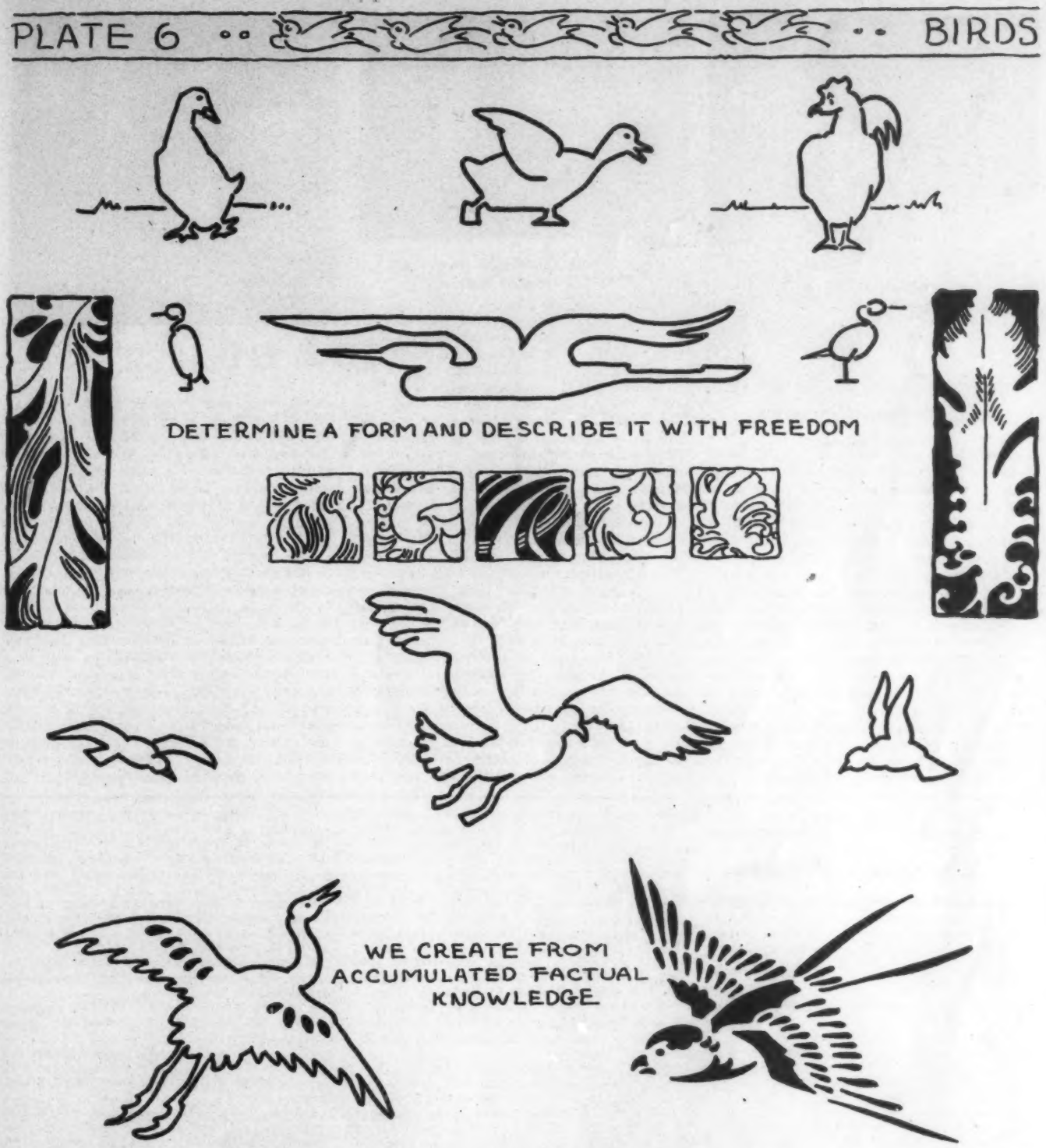


PLATE 6 •• •• BIRDS
DETERMINE A FORM AND DESCRIBE IT WITH FREEDOM
WE CREATE FROM ACCUMULATED FACTUAL KNOWLEDGE
THE MORE YOU CREATE THE EASIER IT IS

Plate 6. Creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

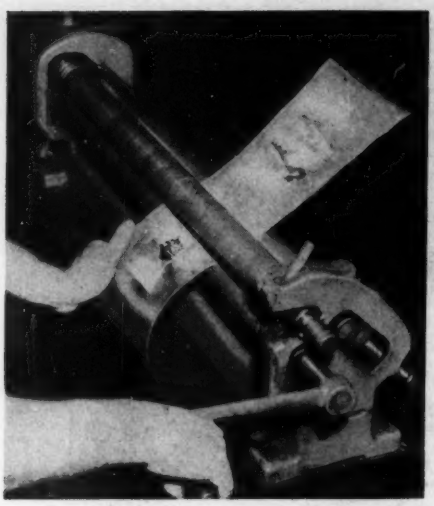


Fig. 3. Straightening out the tin

(Continued from page 37)

second operation is a little tiresome and it is better to spread the job to two or even three boys rather than to tire one out and discourage him.

A forming machine, with the rolls set properly, will straighten out the can in one operation. One boy can carry out this task. Figure 3 illustrates the operation.

The next part of the job depends upon equipment. If a squaring shear is available the operation will be simplified and one person can carry out the work of trimming the double seam at top and bottom and the grooved seam on the end. If the shear is not available and snips have to be used it would probably be better to put several boys on the job of trimming. This operation takes off all seams. The operation is shown in Figure 4. When the seams are removed, the tin will again spring back into an arc, but a second rolling on a properly set forming machine removes this arc, leaving a perfectly flat piece of tin plate ready for reworking into a school project.

Fig. 5. A spun ash tray from a can top or bottom

For soldering, the seams of the project will no doubt have to be rubbed slightly with steel wool in order to remove the oxidation that may have formed. Some of the cans are found to have a golden lacquer on the inside. It is possible to remove this, and it must be removed to solder, or if the cans of the different finishes are separated, this lacquered side may be used wisely to give a finish to the project.

Tops and bottoms have been the greatest problem to the author. They can, of course, be used for bottoms of cylindrical projects or backs of others, or they may be hammered up into round reflectors or shallow bowls or trays, or kettle tops. However, a particular use to which they have been put in this particular shop is in spinning small trays. This may be done on a wood-turning lathe. If a lathe is available the spinning is easy and requires little preparation and little equipment.

As can be seen from Figure 5, the tray is being spun over a simple form turned from a piece of hardwood that has been mounted in a chuck. The top or bottom of the can is attached to the form with small roundhead wood screws, one at each corner. The tool used is the handle of one of the smaller turning tools or any rounded piece of hardwood. The tool rest is probably the most difficult part to make, but if a small length of 1-in. square metal can be had, it may be used as the bar. Drill rod or any salvaged round rod about ⅜ in. in diameter can be used for the pins and the post can be of stock of such size as to slip into the tool rest holder of the lathe. A lubricant of soap and engine oil cooked together will be suitable for use as a lubricant. It will make the tool slide easily across the metal with light pressure, and with a slow speed the metal can be spun into the form. Figure 5 shows this operation as well as a top (or bottom) of the can as raw material, and a completed tray. Tray rims may be trimmed to any desired shape and may be formed, if cut into triangular or square shape, so that the corners act as feet. The trays may be finished with lacquer, jack frost giving a good appearance, or they may be painted.

Fig. 4. Cutting the seams from the salvaged tin

Personal News

♦ J. W. THOMPSON, state supervisor of trade and industrial education for Illinois, has returned to his duties after a leave of some time because of illness.

♦ O. M. ADERS, recently of Attica, Ind., is now Director of Training, Perfect Circle Co., Hagerstown, Ind.

♦ CARL E. FRANKSON, Ball State Teachers College, is on leave of absence to continue work on his doctorate degree at Ohio State University.

♦ J. EVERETT LIGHT, who formerly taught at Rushville, Ind., has been added to the staff of the Department of Industrial Arts at the Teachers College of Connecticut at New Britain, Conn.

♦ FRANK R. FLOWER has been appointed assistant superintendent of schools of Atlantic City, N. J. He will be in charge of the maintenance of all buildings, vocational education, and industrial arts. The position became vacant upon the recent death of Frederick M. Harman, who has been assistant superintendent for many years. RALPH TRUITT was named as assistant to Mr. Flower for building maintenance.

♦ CLAUDE KEENAN, formerly a woodwork instructor at Oklahoma City, Okla., has accepted a position in the personnel department of the Douglas Aircraft Corporation of that city.

♦ PAUL DARE, former instructor of industrial arts at Audubon, N. J., is now acting superintendent of schools in that town. RANDALL SMITH and WALTER KONSCHAK are new members of the industrial-arts teaching staff.

♦ JAMES J. CRAWFORD, of the State Teachers' College, Trenton, N. J., has taken a leave of absence to supervise a radio training program for Temple University. His place is being filled by CONRAD JOHNSON, formerly of Toms River.

♦ E. R. SHELDON, formerly supervisor for state board of education of Kansas, has been appointed superintendent of schools at Burlington, Kans.

♦ RICHARD FAUHL, formerly an instructor in woodwork at Oklahoma City, Okla., has accepted a position as instructor in radio at Chanute Field, Rantoul, Ill.

♦ FREDERICK E. SEARLE, superintendent, Henry Ford Trade School, Dearborn, Mich., was honored at a banquet given by his instructors in recognition of his 25 years of service at the school.

♦ AUBURN J. LAMB, formerly instructor at Granby High School, Norfolk, Va., has been commissioned ensign in the U. S. Naval Reserve.

♦ ERNEST HERKLOTZ has been transferred from Southern High School, Lothian, Md., to Annapolis High School, Annapolis, Md.

♦ W. R. GOUGH was granted leave of absence from the Jefferson Vocational School, Roanoke, Va., to accept a commission as Lieutenant Junior Grade in the Naval Reserve. He was assigned to duty as a vocational training officer.

♦ ROY N. WALTERS, printing instructor, Berea College, Berea, Ky., has been appointed acting dean of the Foundation School of the college while the regular dean is away on a year's leave of absence.

♦ GORDON JONES, formerly junior high school industrial-arts instructor, has been appointed local director of the evening school program, Abilene, Kans.

♦ ROLAND A. COX, formerly in charge of production printing at the College of the Ozarks, Clarksville, Ark., has been elected trade printing instructor at Salina, Kans.

♦ HENRY MITZNER, graduate of The Stout Institute, Menomonie, Wis., has been commissioned a lieutenant in the air corps.

♦ ROBERT MITCHELL, one of the 1942 graduates of The Stout Institute, has joined the armed forces.

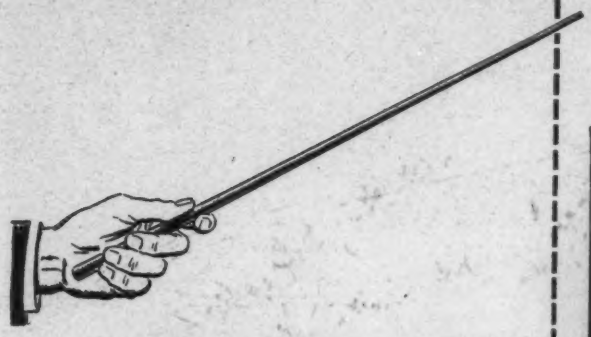
♦ G. G. STARR, formerly superintendent of schools, Arcanum, Ohio, has been appointed dean of instruction at Pfeiffer Junior College, Misenheimer, N. C.

♦ D. G. DANIELS has been appointed assistant supervisor of agricultural education for the Illinois State Board for vocational education. He also is acting secretary of the Illinois Association of the Future Farmers of America.

♦ The following members of the Indiana Industrial-Education Association are teaching at the locations indicated in the following list:

WILLIAM A. FIELDS at Kokomo, Ind.; REX E. BREEDEN at Clinton, Ind.; MELVIN L. DAVIES at Shelbyville, Ind.; LOUIS BREEDEN at Mitchell, Ind.; CLARENCE E. ROBBINS at the Indiana State Teachers College at Terre Haute, Ind.; EDISON CLARK at Wadena, Ind.; LOWELL YAW at

(Continued on page 16A)



"The Lesson for Today..."

EXPERIENCE in the field is a good teacher—but a slow one. The industrial arts school is the very cradle of mechanical education. It can ground the student-mechanic, not only in the fundamentals for job seeking, but also in many of the broader ramifications of tool using required for job *advancement*.

Systematized production, diversified materials and a wide range of products have made filing a highly specialized type of tool work—with a lot of quirks and conditions the finished mechanic must understand.

How to select *The right file for the job* is as important as how to use and care for files in general. There are many files today which are specially designed for individual purposes and materials. . . . Files for Stainless Steel, Aluminum, Brass, Lead, Plastics, Foundry Castings, Die Castings, Die and Fine Instrument making (usually in Swiss Pattern files), Lathe filing, Shear Tooth filing, for example. An extract from a typical Nicholson Technical Bulletin on one of these files appears at the right.

For the mere asking, a complete set of such Bulletins may be had by any school management or instructor. To obtain any of these Special Purpose Files themselves—in either Nicholson or Black Diamond brand—consult a good mill-supply house.

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SHEAR TOOTH FILES

Prepared by
RESEARCH DEPARTMENT • NICHOLSON FILE CO.

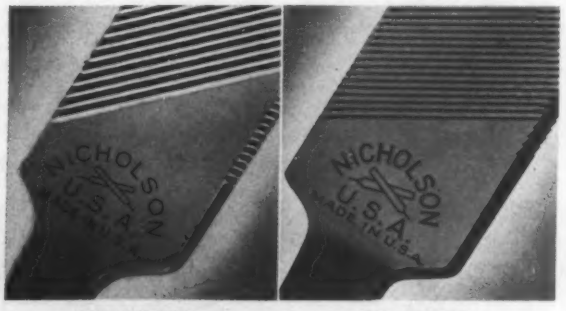
THE PURPOSE OF THE SHEAR TOOTH FILE. In general, double cut files remove stock faster than single cut files, but single cut files leave a smoother finish. Shear Tooth Files are the result of a series of experiments and tests to produce a single cut file which would remove material rapidly and leave a better finish than a double cut file of the same coarseness.

Nicholson and Black Diamond Shear Tooth Files have a relatively coarse single cut with a long angle. (See, below, comparison with regular Mill Bastard.) The combination of the coarse single cut and the long angle helps the file to clear itself of chips, thus minimizing any tendency to clog on the softer materials. The coarseness of the cut provides a fast cutting file and the long angle results in a shearing or shaving cut which leaves a very smooth finish.

USES OF THE SHEAR TOOTH FILE. These files were designed especially for use on aluminum, copper, brass and similar metals. They are likewise adapted for filing materials such as wood, hard rubber and bakelite, which have a tendency to fill up the teeth of ordinary files. They will also be found serviceable on cast iron and steel.

Shear Tooth Files are commonly used for removing fins and flashings from aluminum castings, rounding up corners and edges of soft metal castings and for other applications where better finish is required than can be obtained with double cut files.

HOW TO FILE WITH THE SHEAR TOOTH FILE. When used for filing soft materials, especially the narrow surfaces, corners and edges, Shear Tooth Files have a tendency to run toward the left because of the long angle. Under such conditions, these files should be used with a diagonal stroke toward the right in order to overcome this tendency. A little care is required to use this file on soft materials, but the proper stroke can be determined with a little experience in the use of the file.



SHEAR TOOTH MILL BASTARD

(Continued from page 42)

Mishawaka, Ind.; RUSSELL J. ROWEN at Evansville, Ind.; JOSEPH E. FLOYD at Merrillville, Ind.; TED GREEN at Attica, Ind.; LLOYD B. GUERNSEY at St. Bernice, Ind.; BASIL PRUITT at Greencastle, Ind.; LAZELLE WOODRUFF at Hobart, Ind.; GEORGE HAYES at West Terre Haute, Ind.; and CARLETON D. STORKE at East Glenn, Ind.

♦ The following members of the National Graphic Arts Education Association are now serving with the armed forces:

AUGUST ANGEL, Pine Mountain Settlement School, Pine Mountain, Ky.

HAROLD A. BIGGIN, Fairmount Junior High School, Cleveland, Ohio.

HAROLD M. COTNER, Lawrence Junior High School, Lawrence, Kans.

RALPH E. DEVER, Miller Junior High School, Aberdeen, Wash.

FRANK DIGIACOMO, The New York School of Printing, New York City.

RICHARD GUYON, Meyran T. Herrick Junior High School, Cleveland, Ohio.

ALBERT HAESSLY, Empire Junior High School, Cleveland, Ohio.

ROBERT F. LANE, Librarian, University of Omaha, Omaha, Neb.

W. H. MILLER, Junior High School No. 50, Brooklyn, N. Y.

THEODORE K. PIERSON, Technical High School, St. Cloud, Minn.

R. W. REUTER, Lincoln High School, Cleveland, Ohio.

N. C. RIBICH, Wilson Junior High School, Cleveland, Ohio.

NORMAN SCHREIBER, Willmette, Ill.

W. HOLMES SMITH, West Texas State College, Canyon, Tex.

C. A. WHITTIER, Alexander Hamilton Junior High School, Cleveland, Ohio.

♦ The Ford Industrial Education Association reports that the following members are now in the armed forces.

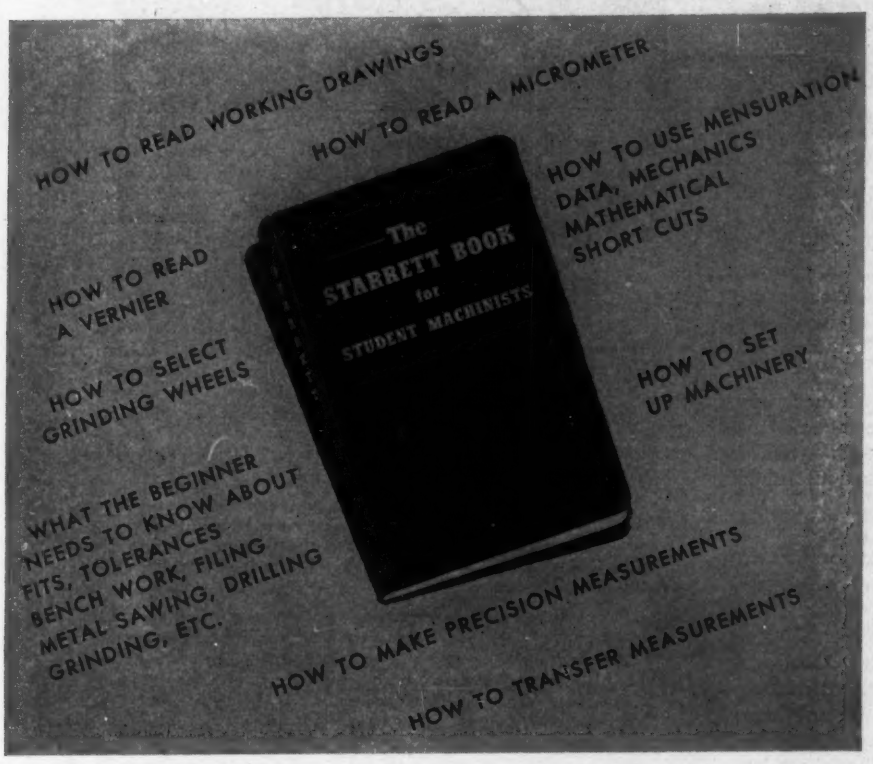
Air force: Walter Dallman, and Michael R. Eric.

Army: Elbert J. Carpenter, Robert Dale, John Darling, Glenn Denny, Albert Grassow, Steve Gregosky, Murry Moore, John Onderko, Braswell Parker, Carl Phillips, Harvey Raad, Robert Ricketts, Hugo Ristow, Earl Robinson, David Simon, Earl Smith, John Truman, Marvin Will, and Harold Young.

Naval reserve: Steve Ferega.

Navy: Berg Decker, James Peltier, Paul Robson, William Rowell, and John Slavich.

Merchant marines: Ray Allen.


HOW TO READ WORKING DRAWINGS
HOW TO READ A MICROMETER
HOW TO USE MENSURATION DATA, MECHANICS MATHEMATICAL SHORT CUTS
HOW TO READ A VERNIER
HOW TO SELECT GRINDING WHEELS
HOW TO SET UP MACHINERY
WHAT THE BEGINNER NEEDS TO KNOW ABOUT FITS, TOLERANCES BENCH WORK, FILING METAL SAWING, DRILLING GRINDING, ETC.
HOW TO MAKE PRECISION MEASUREMENTS
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Association News

♦ The Wisconsin Industrial Arts Association held its annual convention on November 5 and 6, 1942, at Milwaukee, Wis.

O. L. Wakeman was chairman at the meeting held Thursday afternoon, at two o'clock in the Marquette University science building.

W. C. Giese, superintendent of schools, Racine, Wis., spoke on the administrator's viewpoint of industrial arts in the present crisis. He emphasized that the true industrial-arts teacher is so imbued with the value and importance of his subject to the youth of America, that he will not abandon his classes now.

He also pointed out the need of collaboration between school and industry in order to get the best approach at training skilled and semi-skilled workers.

Dr. Stewart Scrimshaw, associate dean, college of Business Administration, Marquette University, then gave the administrator's viewpoint on the same theme treated by the previous speaker.

He emphasized that the industrial-arts teacher should condition his students, give them the necessary related information and the basic skills so that when they enter business and industrial life, they have at least a groundwork upon which to build their future life.

He also pointed out that industrial-arts teachers must have the vision to see and the will and adaptability required to try out new and untried proposals. He also warned them not to overlook the needs of women who also needed shopwork, not only now but also for the postwar era.

Clyde Bowman, dean of The Stout Institute, Menomonie, Wis., gave a short report of the activities of the curriculum committee.

The various industrial-arts group meetings were held on Friday afternoon.

Clayton R. Francke, Milwaukee, was chairman at the mechanical drawing session.

The *Problems Involved in the Rapid Transformation of an Industry From Peace to War Production* were discussed by Erwin C. Tews, chief engineer and general manager, Ben-Hur Mfg. Co., Milwaukee, and Theodore L. Swansen, engineer, Supercharger Div., Allis-Chalmers Mfg. Co., Milwaukee, spoke on *The Drafting Room's Place in Development Work.*

At the woodworking section over which W. M. Hurst, Fond du Lac, presided, Ervin H. Grosskopf, Boys Technical High School, Milwaukee, spoke on *The Contribution of Woodwork in This Crisis.*

Jigs developed by local teachers for help in the production of model airplanes for the navy were on exhibit, and some of the discussion was centered upon them.

At the session devoted to the one-man shop, Curtis J. Greenwood, Oconomowoc, presided. The speakers were Harold J. Schantz, director of industrial arts, Platteville State Teachers Col-

(Continued on page 18A)

In the classroom the JAM HANDY slidefilms and motion pictures help the teacher SHOW what he means with pictures large enough for every member of the class to see.

If the challenge is to be met—in every school, the HIGH-SCHOOL VICTORY CORPS needs to be well trained . . . *quickly.* New subjects need visual aids to help accelerate learning . . . Tens of thousands of JAM HANDY discussional slidefilms* and motion pictures have been enlisted in this new program . . . to help students SEE and learn . . . There are 17,015 pictures—photographs, charts, drawings and cross-sections—in these slidefilms . . . *Use* of these discussional slidefilms and motion pictures by schools and the armed services is endorsement of their authenticity and effectiveness.

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Automotive Mechanical Training Kit-set No. 1—2,825 Pictures
Units of Automobile, Mechanical Principles, Operation, How It Works—(35 slidefilms)

Automotive Mechanical Training Kit-set No. 2—1,210 Pictures
Care and Repair of Passenger Cars and Trucks—(35 slidefilms)

Basic Electricity Kit-set—883 Pictures
Fundamentals of Electricity—(12 slidefilms)

Machining Kit-set—860 Pictures
Fundamentals of Machine-Shop Work—(16 slidefilms)

Oxyacetylene Welding Kit-set—742 Pictures
Fundamentals of Oxyacetylene Welding—(15 slidefilms)

Bench Work Kit-set—970 Pictures
Principles of Bench Work—(10 slidefilms)

First Aid Training Kit-set—1,084 Pictures
A visual training course for first aid—(20 slidefilms)

Selling in America Kit-set—392 Pictures
Distributive Education—(5 slidefilms)

Bridging the Gap Between School and Business—524 Pictures
Distributive Education—(4 slidefilms, 8—15-minute presentations)

Pre-Flight Aeronautics Slidefilm Kit-set—1,742 Pictures
(24 slidefilms)
A slidefilm training course based on the official ground school material of the Civilian Pilot Training Program and checked and approved by the Civilian Pilot Training Service of the Civil Aeronautics Administration. Hundreds of these are in use in schools, C. P. T. P. franchised units and the armed forces.

Aircraft Engine Mechanics Kit-set—1,453 Pictures
Care and Repair of Airplane Engines—(25 slidefilms)

Aircraft Mechanics Kit-set—2,742 Pictures
Care and Repair of an Airplane—(46 slidefilms)

Aviation Metalsmiths Kit-set—879 Pictures
Metalsmithing in Aviation—(15 slidefilms)

Sound Motion Pictures available—16 subjects—on Radio, Electricity, Machines, Automotive Mechanics, General Science, Shop Work, Aircraft Mechanics and others. Information about motion pictures on any of these subjects will be sent on request.

**Film strips with textual material on 35 mm. film which provide for the teacher's own commentary and permits classroom discussion while being shown*

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The JAM HANDY Organization

★Washington, D. C. Transportation Bldg. ★Dayton 311 Talbott Bldg. Chicago Angeles

(Continued from page 16A)

lege; Otto A. Steinke, Beaver Dam; and M. E. Faber, The Handcrafters, Waupun; and the subjects discussed were *Things the Industrial-Arts Teachers Can Do to Better Prepare Pupils for Industry, How to Improve Drafting Technique to Meet Demands of Industry,* and *An Outsider Looks In.*

Stanley Sorensen, Racine, presided over the meeting for the machine shop and general metal. The subject chosen by W. C. Mason, superintendent of planning and time study, J. E. Case Co., Racine, was *What Industry Hopes to Find in Industrial-Arts Trained People.*

The teachers of printing for their group session, had invited R. Randolph Karch, principal, Printing High School, Cincinnati, Ohio, to discuss with them *The Challenge Confronting the Printing Instructor.* This speaker, well equipped by his years of practical and teaching experience, held his hearers spellbound for over an hour. He also furnished them each with a 12-page outline of his talk, and a helpful packet of excellent promotional material designed to give high school students a real understanding of what it takes to be a printer.

At the business meeting Thursday afternoon, the new officers elected for the coming year were: president — Leslie W. Browne, Delavan, Wis.; vice-president — Harvard C. Smith, Kenosha, Wis.; and committeeman at large — Carl Ludeman, Waukesha, Wis. H. H. Shufelt, Racine, continues as secretary-treasurer.

The association, at the Thursday afternoon meeting, presented honorary life memberships to John Callahan, state superintendent of education, Madison, Wis.; Burton E. Nelson, president, The Stout Institute, Menomonie, Wis.; Dr. Homer J. Smith, professor of industrial education, University of Minnesota, Minneapolis, Minn.; Geo. R. Martins, assistant manager of the order department, Falk Corporation, Milwaukee, Wis.; Roy R. Van Duzee, director of vocational and adult education, West Allis, Wis.; Fred L. Curran, retired; V. M. Russell, retired; and John J. Metz, editor, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Milwaukee, Wis.

The Middle Atlantic States Regional Conference on Graphic Arts Education, the sixth in a series of national conferences planned by the National Graphic Arts Education Association, held at Hotel Pennsylvania, New York City, Saturday, November 14, was an outstanding success. Eight states and the District of Columbia were represented in the 165 persons present, including school officials, editors, printing leaders, as well as teachers of printing. The meeting was arranged by the Printing Teachers Guild of New York, under the general direction of J. Henry Holloway, principal of the New York School of Printing and the first president of the National Graphic Arts Education Association. The program was a varied one, and covered a full eight hours.

Of special interest was the Fellowship Luncheon, presided over by Thomas Roy Jones, president of American Type Founders, and president of the National Printing Equipment Association, with Dr. Frederic W. Goudy as the guest of honor. Dr. Goudy was presented with an especially bound copy of his own great book, *The Alphabet.*

Another interesting feature just before the luncheon, was an "Information Please Quiz" on problems of current interest in the field of the graphic arts, with O. Alfred Dickman, advertising production manager, the New York *Herald-Tribune,* as the quiz master. Six questions had been prepared beforehand and distributed at the time of registration, giving each person the opportunity to signify the question to which he would respond.

Miss Marjorie Fish, O.T.R., director of Professional Courses in Occupational Therapy, Columbia University, introduced a new feature, since she spoke on "Occupational Therapy — Its Place in Graphic-Arts Education." The speaker showed how training in printing is being used increasingly to restore health and usefulness to the physically incapacitated.

The keynote address was delivered by Hupp. E. Otto, president of the National Graphic Arts Education Association, and assistant principal, McKinley Trade School, Wheeling, W. Va. He spoke on the theme, "The War and the School Print Shop."

Three speakers addressed the conference on the general topic: "Opportunities and Responsibilities of Graphic-Arts Education." John A. Wilkins, Advertising Club of New York War Work Council, and representing the Office of Civilian Defense, gave a strong address on "The Relation of Graphic Arts to Government." John A. Backus, educational director, American Type Founders, spoke out of a rich experience on "Graphic Arts and the Schools." "The Relation of Graphic Arts to the Community" was handled in a masterly manner by Patrick F. Boughal, executive member, Vocational High School Teachers Association, New York City.

A particularly challenging address was given by Ralph W. Haller, principal of Andrew Jackson High School, St. Albans, N. Y., on "Stop, Look, Listen — Danger Ahead! Mr. Haller told of the threats that are confronting teachers — insecurity in position, reduced appropriations for education, attacks on tenure, and other privileges long experienced by the teaching profession.

Three interesting speakers offered valuable suggestions on the relationship between the teacher and the student through the medium of the student clubs. Allan Robinson, a past president of the National Graphic Arts Education Association, told of the development, current activities, and future possibilities of the National Student Graphic Arts Society. James W. Brown,

(Continued on page 21A)

Filing Hints to meet war-time needs

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SAW AND MILL FILES

Mill files, and saw files of triangular and special cross-sections, are of particular use for sharpening saws of several kinds. They are always single cut,—having unbroken courses of teeth running across the file surface, all parallel to one another and at an oblique angle to the axis of the file. They include the following shapes:

SHAPE	CROSS SECTION	CHARACTER OF TEETH	TAPER	GENERAL USES
Mill	▭	Single cut on sides (face) and edges. Also made with one round edge, two round edges, and blunt	Tapered slightly in width and thickness	Sharpening mill, ice and circular saws, axes, implements, knives, shears, tools; lathe work; draw filing; polishing
Taper (Triangular Or Three Cornered)	△	Single cut	Tapered on three sides to point	Sharpening saws, axes and milling cutters
Slim Taper	△	Single cut	Tapered on three sides to point	Sharpening circular, cross-cut and buck saws
Extra Slim Taper	△	Single cut	Tapered on three sides to point	Sharpening fine-tooth hand and hack saws
Double Extra Slim Taper	△	Single cut	Tapered on three sides to point	Sharpening fine-tooth saws
Cant Saw	△	Single cut on three sides and two edges	Uniform throughout length	Filing M-shaped teeth of cross-cut saws
Cross-Cut	◡	Single cut	Uniform throughout length	Sharpening cross-cut saws of the great American type. Also wood or buck saws
Pit Saw	◡	Single cut	Uniform throughout length	Filing teeth of pit or frame saws

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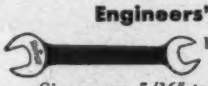
● Since Williams' "Superior" (Carbon Steel) Wrenches provide exceptional strength with minimum use of critical materials, a review of standard available types is timely. "Superior" Wrenches are approximately twice as strong as earlier carbon steel wrenches of our manufacture. Comparative tests demonstrate that they average (throughout all patterns and sizes) 93% as strong as our corresponding alloy steel "Superrenches", which we feel are among the strongest wrenches ever manufactured commercially.

A description of the most generally used "Superior" wrench types follows. More detailed information is contained in Williams' Wrench Booklet, No. A-81, which will be mailed for the asking.

Engineers' Pattern



15° Angle, Double Head. For general service.

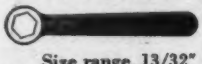
Size range, 5/16" to 5-3/8" openings.
Also single head style, 3/16" to 7-5/8".

Check Nut or "Thin" Pattern

15° Angle, Double Head. For Check, Jam or Lock Nuts, etc.

Size range, 13/32" to 1-1/2" openings.
Also single head style, 7/16" to 1-11/16".

Hex-Box, Regular Pattern

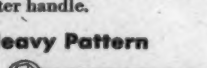


15° Angle, Single Head. For general service.

Size range, 13/32" to 4-5/8" opening.
Larger sizes, from 3-3/8" to 4-5/8" opening, are also furnished with *striking face* on end of shorter handle.

Hex-Box, Heavy Pattern

15° Angle, Single Head. For heavy duty.



Size range, 1-1/4" to 3-1/8" opening.
Also made with *striking face* on end of shorter handle throughout full size range.

Set Screw Pattern

22-1/2° Angle, Double Head. For Set Screws, Square Cap Screws & Nuts.

Size range, 3/16" to 1-1/8" opening.
Also single head style, 3/16" to 1-1/8".

"S" Pattern

22-½° Angle, Double Head. For Standard Nuts and Cap Screws.

Size range, 5/16" to 2" opening.

Machine Pattern

Straight Opening. Dbl. Hd. Extra heavy for Planers, Milling Machines, Lathes, Drill Presses, etc.

Size range, 3/8" to 1-7/16" opening.

Tool Post Pattern

For Set Screws only.

For Nuts and Set Screws.

Nos. 554 to 557, for set screw sizes (both ends) 7/16" to 3/4".
Nos. 562B to 568D, openings 5/8" to 2".
Same opening both ends.

Heavy "S" or Car Pattern

22½° Angle, Double Head. Long leverage wrenches primarily for railroad use.

Size range, 5/8" to 2-7/16" opening.

Construction Pattern

15° Angle. Straight handle. Deep opening for square nuts, and tapered handle for lining-up bolt holes.

Size range, 7/16" to 2" opening.

Structural Pattern

Straight opening. Offset handle. Deep opening for square nuts, tapered handle for lining-up bolt holes.

Size range, 7/16" to 2" opening.

Face Spanners

For general service.

Size range, 1" to 4" C to C of pins, in 1/4" multiples. Also Adjustable Face Spanners in 3 sizes with 2, 3 and 4" capacities.

Pin Spanners

For general service.

Size range, for circle diameters 1" to 6".

Hook Spanners

For Taper Nose Lathe Spindles and general service.

Size range, for circle diameters, 7-3/8", 9-1/4" and 12-1/2". Also Adjustable Hook Spanners in 3 sizes for circle diameters ranging from 3/4" to 4-3/4".

Pin Handle Sockets

With Hex or Square Opening for general service.

Size range:
Hex openings 5/16" to 2-3/8".
Square openings, 1/8" to 2".

Offset Sockets

With Hex or Square Opening for general service.

Size range: Hex openings, 5/16" to 2-3/8". Square openings, 1/8" to 2".

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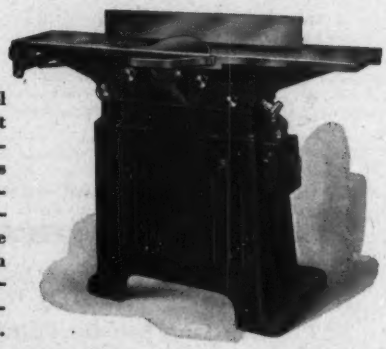
NO. 144
HAND PLANER and JOINTER



The Oliver No. 144 is a most efficient planer and jointer, for practical school shop use. Made of the best of materials and workmanship it will give many years of real service. Fully guarded. Direct motor drive—safety inserted knife type cutterhead equipped with three high speed knives—adjustable bevel fence—rabbeting arm—and wrenches.

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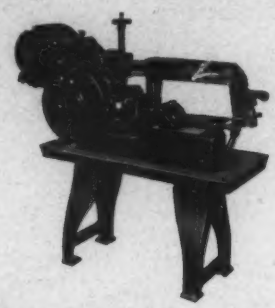
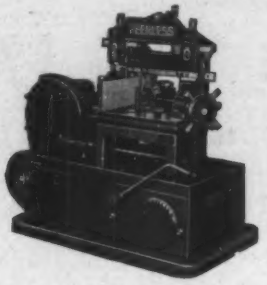

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( ) Catalog of complete Peerless line: Hydraulic, Vertical and Universal Metal Sawing Machines
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School or Company.....
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FAST, ACCURATE CUTTING DEMANDS POSITIVE BLADE CONTROL

(Continued from page 18A)

president of Editor and Publisher, and president of the International Benjamin Franklin Society, told of the part that the late John Clyde Oswald took in the organization of the society, its activities through the years, and its desire to see Benjamin Franklin Societies in every school of printing. "Why a School Newspaper and Editorial Board?" was answered by a well-known authority in that field, Joseph M. Murphy, director, Columbia Scholastic Press Association, Columbia University.

Dr. Clare Baldwin, administrative assistant, Board of Education, New York City, who has done an invaluable educational job in working out an industrial-arts course of study on the junior high school level for the New York schools, outlined its application to graphic-arts education. "Graphic-Arts Education in the Senior High School" was discussed by Hugh Flaherty, director of industrial arts, Floral Park, N. Y.

"The Vocational and Technical High School Graphic-Arts Course" was presented in an authoritative manner by Dr. Ronald W. Kent, assistant director, vocational and technical high schools, Essex County, N. J., and lecturer on education at New York University. Another address with a distinctly practical vocational slant was that of Robert Metcalf of the New York Apprenticeship Council, New York State Department of Education, Albany, N. Y.

As a diversion of a highly instructive nature, adding variety to the program, the sound and color film, "More Than Meets the Eye," distributed by International Printing Ink, was shown. Credit is due Joseph M. Howlin, president of the New York Printing Teachers Guild, chairman of the meeting, for the smooth and tactful handling of a program of such scope and noteworthy features. The committee on conference promotion consisted of William A. Place, chairman, Thomas F. Driver, and Francis X. Sullivan; the committee on arrangements, Felice Alfano, chairman, Leo Hochwald and James Meurer — all members of the New York Printing Teachers Guild.

♦ The 70th annual session of the Northwestern Ohio Teacher's Association was held on October 30–31, 1942, at Toledo, Ohio.

The industrial-arts departmental meeting was held at Macomber High School at 9:30 a.m., Friday, October 30.

Prof. D. R. Loman, industrial-arts department, Ohio Northern University, Ada, Ohio, was the chairman.

E. A. Hauenstein, head of the department of industrial arts, Central High School, Lima, Ohio, gave an address on "A Drawing Program for Secondary Schools."

Dr. John A. Whitsel, professor of industrial arts, Miami University, Oxford, Ohio, spoke on "Graphic Arts in the School Program."

The group unanimously voted to become an affiliated member of the American Industrial Arts Association.

G. C. Mason, department head of industrial arts, Van Wert High School, Van Wert, Ohio, was elected chairman for the ensuing year.

— *G. C. Mason*

♦ Zeta Chapter of Epsilon Pi Tau, national honorary fraternity in industrial arts and vocational industrial education, held an informal dinner meeting on Friday, November 6, at Rice Hotel, De Kalb, Ill. The guest speaker on this occasion was Dr. William E. Warner of Ohio State University, who is the National Secretary of Epsilon Pi Tau.

Chi Chapter of this fraternity held a dinner meeting at the Talli-Ho Inn at Park Ridge, Ill., on Tuesday, November 17, at 7 p.m. The speaker at this meeting was Dr. Johnson, Superintendent of Schools of Chicago, and Dr. Newkirk presented a film on industrial-arts work as it is carried out in Chicago.

♦ The National Graphic Arts Education Association have determined to hold regional rather than national conferences during the duration. To date such regional conferences have been held in Minneapolis, San Francisco, Los Angeles, Dallas, and New York.

♦ The fall meeting of the Newark Industrial Arts Teachers' Association was held at Beb's Restaurant, Newark, N. J., on November 16.

Mr. Potter, vocational director of Casey Jones School of Aeronautics, gave the members a fine insight into the need for qualified ground crew personnel.

The officers in charge of the association for 1942–43 are as follows: president, Howard G. Stintsman, East Side High School; vice-president, David Wolfe, Ivy Junior High School; secretary, Albert Bradbury, Central High School; and treasurer, Herbert Hartley, Bragraw Avenue School. The Board of Governors consists of the above mentioned officers and Walter Siegwarth, Central High School; David Sachman, Ann Street School; and Daniel Verniero, Weequahic High School.

♦ The New Jersey Vocational and Arts Association will hold its annual convention on January 14, 15, and 16, 1943, at Hotel McAlpin, Broadway and 34th St., New York City.

. . . There must be a clear concept of the philosophy: that vocational education is not job training alone, but direction toward and training for complete and satisfactory living; that five factors are involved — occupational information, guidance, training, induction into employment, and follow-up.

— *The Michigan Program for Vocational Education*

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News Notes

♦ On account of the difficulty encountered in obtaining vocational instructors with both the required trade qualifications and a teaching certificate, the state board of education of Pittsburg, Kans., took action at a recent meeting which will assist in the solution of this problem. By this action it is now possible for people who have the required trade experience for instructing trade subjects to secure from the state board for vocational education a certificate for teaching a trade in a specific school. The certificate will be renewable from year to year upon condition that the holder completes required professional training under the direction of the state supervisors.

If an instructor holding a vocational certificate is required to instruct prevocational or industrial-arts courses, a prevocational certificate may be secured from the State Superintendent of Public Instruction. This certificate will entitle the holder to instruct prevocational subjects that are directly related to the trade for which vocational certification has been given.

♦ The expanded facilities of the United States Maritime Commission in the construction of cargo and war-purpose ships and the production of materials for them has created a need for additional inspectors. Persons with technical experience in the manufacture of paints and textiles, and those with inspectional, mechanical, or production experience in other fields are being sought by the United States Civil Service Commission. Applications should be filed with the Civil Service Commission.

Positions pay $2,600 a year entrance salary. For the inspection of paints, applicants must have had appropriate experience in the manufacture or inspection of paint or paint products.

For the inspection of textiles applicants must have had appropriate experience in the inspection or manufacture of textiles, including examination of constituent materials. This experience must have included the inspection of cotton materials and at least one other material: either woolens, rayons, linens, or silks. Formal education in textile technology or textile engineering is desirable but is not required.

Applicants may qualify for the inspection of general equipment if they have had appropriate experience in the inspection of certain of the equipment, or if they have had appropriate mechanical or skilled production experience in the manufacture of mechanical or electrical equipment, or if they have had experience as journeyman machinist or journeyman toolmaker.

There are no age limits for the positions. No written test will be given. It is desirable that applicants be able to make written reports clearly and intelligently. Applicants' qualifications will be judged from their experience, education, and training, and on corroborative evidence secured by the Commission. Applications are not desired from persons engaged in war work unless a change of position would result in the utilization of higher skills.

Information may be obtained at any first- and second-class post office or from the Commission's Washington office. Applications must be filed with the United States Civil Service Commission in Washington, D. C., and will be accepted until the needs of the service are met.

♦ A great shortage of industrial-arts teachers has developed in the state of New Jersey. Many school shops have been closed for the want of qualified instructors. Emergency training programs in industrial-arts teacher training have been in progress at Newark State Normal School, Trenton, N. J., State Teachers College, Trenton, N. J., and Rutgers University, but there are still many vacancies created by men leaving for the military service that have not been filled. Additional emergency training programs are now being organized.

♦ Four Indian boys from the seventh and eighth grades at St. Mary's Mission School, Red Lake, Minn., demonstrated their proficiency and skill when they produced a chair, from rough stock to the finished product, in 45 minutes.

The 4-H club to which they belonged won 28 awards at the county fair.

♦ The Army-Navy Production Award for excellence in war production was made to the employees and management of the Atlas Press Co., Kalamazoo, Mich., on November 10, 1942.

♦ Schools can get films ranging in content from an R.A.F. bombing raid on Germany to the "why and how" of scrap salvage. The films may be obtained for school use by writing the Bureau of Motion Pictures, Office of War Information, Washington, D. C.

♦ The Benjamin Franklin Printers' Guild of State Teachers College, California, Pa., may well be proud of its limited edition of 100 copies of the book dedicated to Anthony T. Stavaski, sponsor of the organization and in charge of printing instruction at the teachers college. It gives a history of the student organization and short sketches of Mr. Stavaski and its members.

Questions and Answers

COLOR IN WALNUT WOOD

1093. Q.: We should like to have some information on native walnut wood. We have noticed in our shopwork that some of the wood has a decided red or red-brown color, while other woods of supposedly the same species, are quite gray and completely lack the red tone. This variance in color has puzzled us for some time. Can you explain the reason? — *K. B.*

A.: There is no production line in nature's program. Hence it is that no two trees grow alike in form or wood, especially specimens which grow on lowland as compared with those on high, dry land. This difference is so marked that many lumber manufacturing plants run their fresh cut boards into a steam kiln long enough to produce an even surface coloring. This is, of course, only superficial, and fools no one in the trade.

The real difference lies in the fact that the colors are sometimes pigmented and again caused by the tannic acid content. The pigmented colors are shown by the lines entirely different than those indicating growth; the tannic acid color is that which reacts to steam, sunlight, or water stains. The latter is the only answer to the production of uniform coloring on new cabinetwork. — *Ralph Waring.*

New Publications

Modernistic Chip Carving

By Victor J. Mankin. Cloth, 71 pages, 6¼ by 9¾ in., illustrated. Price — cloth, $1.75; paper, $1.25. Published by The Bruce Publishing Company, Milwaukee, Wis.

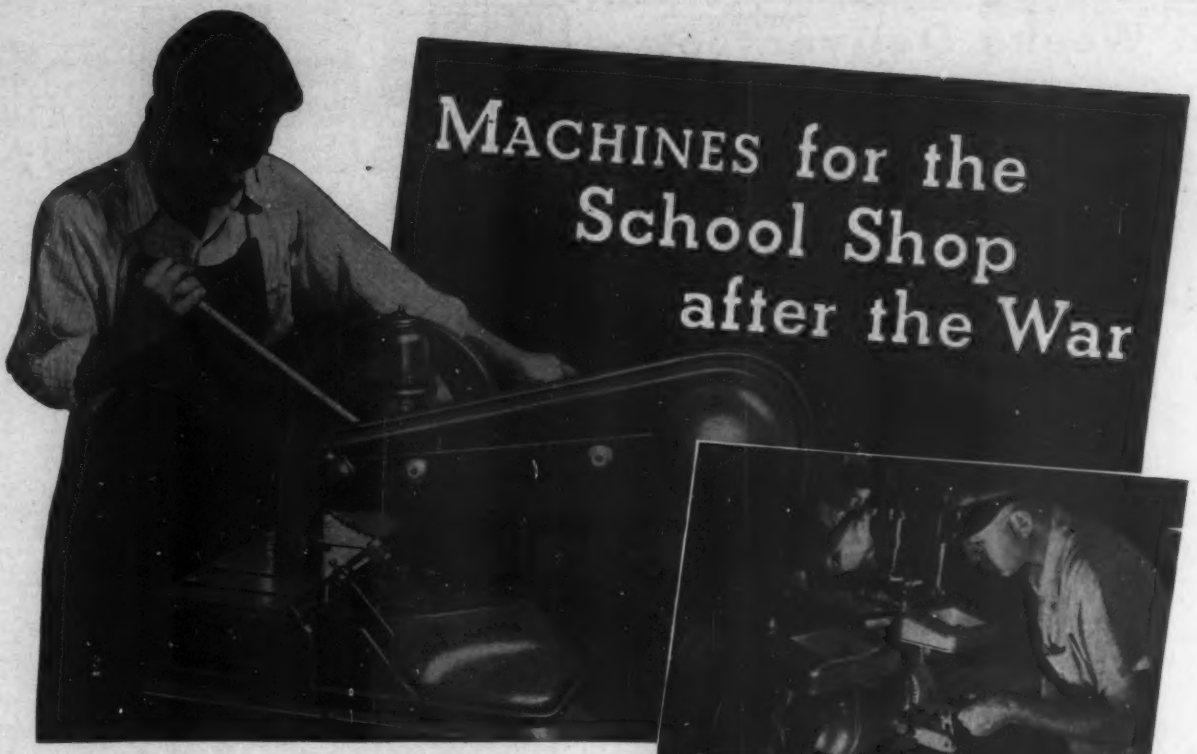
An interesting portrayal of how one can learn to do this type of carving in a surprisingly short period of time.

The student will be delighted with the results he is able to produce from the very start. The author also shows how the designs may be produced, and how easy it is to adapt them even to complicated projects.

Work Book of Machine Shop Projects

By Roy E. Knight. Paper, 109 pages, 8 by 10¾

(Continued on page 24A)



☆ The War has helped teach American Industry a *Vital Lesson!*

Even before the war created the need for production miracles—there was a widespread acceptance of Delta low-cost machines in almost every branch of American Industry. But now—in their hour of urgent need—our manufacturers have turned toward the so-called "light machine tool" on a scale that few people fully appreciate.

In tens of thousands of plants—including aircraft, armament, ship building, plastics, general manufacturing—Delta machines have given an appreciable lift to war production. Some single plants have as many as two thousand individual Delta machines operating at full capacity.

The reasons for this basic change in our industrial production methods include: Increased output, ease of training operators, availability, adaptability, flexibility, low first cost, low maintenance cost and portability.

Many far-sighted industrial education departments have anticipated this trend and made Delta machines an integral part of their training program. Many others recognize that this important change in industrial production technique must inevitably influence greatly the future of vocational training.

DELTA
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Are you getting "Tooling Tips?"

Delta issues an interesting bulletin that enables industrial educators to keep informed about the latest machine developments in the industrial field. If you wish to receive "Tooling Tips" regularly, just fill out and mail the coupon at right. There is no subscription charge, no obligations of any sort.

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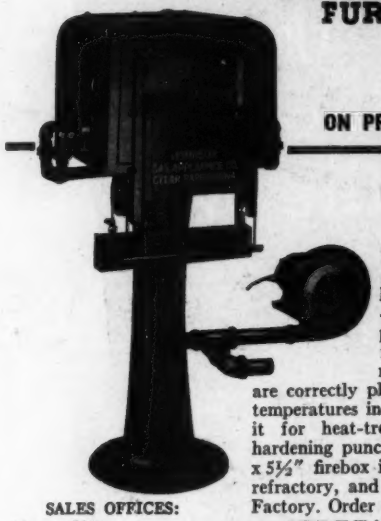

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E. H. SHELDON & COMPANY
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(Continued from page 22A)

in. Published by The Connersville News-Examiner, Connersville, Ind.

This book is designed for high school and vocational students. It presents quite a number of machine-shop projects in blueprint form, together with operation sheets on which the student must indicate how he will perform his work.

Shipbuilding Blueprint Reading

By Joseph L. Tomlinson. Paper, 208 pages, 8½ by 11 in., illustrated. Price, $3. Published by American Technical Society, Chicago, Ill.

This is a real blueprint reading course for men employed in shipbuilding. No attempt is made to teach drawing because the author feels that the ability to read blueprints is of greatest importance to the men who must work with the endless number of details which make up the hull of a vessel.

Simple arithmetic, a glossary, and a list of abbreviations used in shipbuilding have been included in the book.

Applied Leathercraft

By Chris H. Groneman. Cloth, 209 pages, 5⅝ by 8½ in., illustrated. Price, $2.50. Published by The Manual Arts Press, Peoria, Ill.

This book, besides clearly explaining the tools and their uses, presents a considerable number of fine projects, and contains an excellent chapter on the history, methods of manufacture, and geographical sources of leather.

Silk Screen Stenciling As a Fine Art

By J. I. Biegeleisen. Cloth, 179 pages, 6¼ by 9¼ in., illustrated. Price, $2.50. Published by McGraw-Hill Book Co., New York City.

This book, written by men who have studied and taught the subject for years, presents clearly how to make the various types of stencils and how to apply the silk-screen process to the production of artistic results.

How to Do Aircraft Sheetmetal Work

By Carl Norcross and James D. Quinn, Jr., Cloth, 283 pages 6¼ by 9¼ in., illustrated. Price, $2.20. Published by McGraw-Hill Book Co., New York City.

This book aims to give a beginner a clear understanding of the fundamentals of airplane sheet-metal processes. It is freely illustrated, and some of the working drawings are in blueprint form.

It has been divided into 15 chapters which present the work under the following headings: Simple Blueprint Reading; Shop Mathematics; Working Properties and Standards of Aircraft Materials; How to Measure; Templates; Aircraft Sheet-Metal Layout; How to Cut Sheets; Files and How to Use Them; Forming, Stamping, and Hydraulic Presses; Drilling and How to Do It; How to Rivet; Jig Assembly in Modern Aircraft Factories; Skin Fitting; Spot Welding; and Shop Projects.

Machine Drafting

By George C. Snow and J. Charles Russell. Paper, 159 pages, 6 by 9 in., illustrated. Price, $1.48. Cloth bound copy available at $2.50. Published by The Manual Arts Press, Peoria, Ill.

A book specially designed for apprentices in the machine trades. The problems chosen are machine tools with which the apprentice has become more or less familiar in his shopwork.

The book also contains a chapter on materials of machine construction.

Aircraft Engine Trouble Shooting Chart

By Andrew Wallace. Paper, 22 by 32 in. Price, 75 cents. Published by Norman W. Henley Publishing Co., New York City.

While this chart was especially designed for learners, it will be found very handy also by experienced mechanics who have to analyze and quickly decide what is the source of some particular trouble so that immediate remedial steps may be taken.

The chart is in diagrammatic form. Troubles are diagnosed through the *sound* section to identify under which trouble group the fault may be looked for. Then the procedures for effecting a remedy are indicated.

Flying Models

By Paul K. Guillow. Paper, 118 pages, 7¼ by 4¼ in., illustrated. Published by Paul K. Guillow, Wakefield, Mass.

This small booklet contains a great deal of information on tools and equipment, materials, methods of constructing the various units, assembling them into a whole, covering the various parts, carving the propeller, balancing the model, test gliding, and making power-test and subsequent flights.

Essential Mathematics for Skilled Workers

By H. M. Keal and C. J. Leonard. Cloth, 293 pages, 5 by 7⅛ in., illustrated. Price, $1.50. Published by John Wiley and Sons, Inc., New York City.

This book contains a review of arithmetic, elementary algebra, practical geometry, logarithms, applied trigonometry, and the slide rule.

A number of useful formulas and tables have been appended. The appendix also contains the answers to the problems in the book.

Strength of Materials

By Edward K. Hankin. Cloth, 148 pages, 5⅝ by 8¾ in., illustrated. Price, $1.50. Published by John Wiley and Sons, Inc., New York City.

This is the eighth edition of Merriman's well-known treatise on the *Strength of Materials*. This last edition, revised by Edward K. Hankin, is a textbook for the beginner in this subject. It is designed for the secondary school level and will also be found valuable for upgrading mechanics and others who find it necessary to learn something about this subject.

You Can Whittle and Carve

By Amanda Watkins Hellum and Franklin H. Gottshall. Cloth, 82 pages, 7⅝ by 10⅛ in., illustrated. Price, $2.25. Published by The Bruce Publishing Co., Milwaukee, Wis.

A book that will delight the beginner and en-

(Continued on page 30A)

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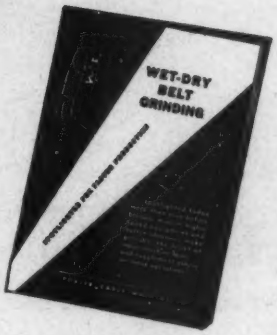
YOUR STUDENTS Will Want to Learn This NEW MACHINE METHOD . . .

PORTER-CABLE

WET-DRY Belt Surfacing



Read this book and you'll quickly see why this revolutionary labor-saving, cost-cutting, waste-eliminating machine has caught on so fast. Hundreds of Porter-Cable Wet-Dry Belt Surfacers in many of the country's foremost plants are doing operations 5 to 50 times faster — on hard and soft metals, alloys, plastics, fibre, hard rubber. They're taking surfacing work off overburdened millers, shapers, grinders, lathes, and are holding limits as close as .0005" where required. Many pieces are finished free-hand, with a big saving on fixtures and set-up time.

For taking off fins, burring, cutting radii, squaring surfaces, cleaning, finishing, this Wet-Dry Belt method is a revelation. It's already reached the point where machine shop operators are better qualified for their jobs if they know how to surface *the Porter-Cable way*. So we say, write for the book!

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Free-hand surfacing six points all at once! Production increased 10 times.

A perfect edge fit, ready for assembly. No machining fixture needed.

Gasket surfaces made true-flat, glass smooth, and dead parallel.

If You're Handling War Work in Your School Shop

You'll get lots of help in holding to quality and meeting delivery dates on war work contracts, the moment you install a Porter-Cable Wet-Dry Belt Surfacer in your shop. And the savings you make will pay for the machine itself. So it's good business, as well as good job training, to make your shop up-to-date. Again we say, write for the FREE new book, Wet-Dry Belt Surfacing — virtually a textbook on this latest production and tool room process.

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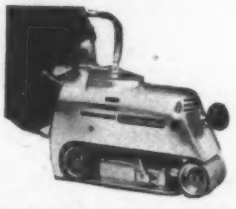

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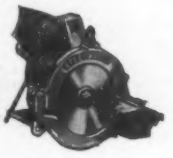

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Shop Equipment News

New Products — Publications

"FLUD-LITE" INSPECTION MAGNIFIERS

The Stanley Works, New Britain, Conn., have just produced an appliance which can be used advantageously with inspection tools of all kinds. These Stanley "Flud-Lite" magnifiers combine magnification and shadow-free fluorescent lighting. Inspectors, machinists, and toolmakers in war-production plants will find it useful for small parts assembly, finding cracks and scratches, inspection of machinists' tools such as reamers, gauges, punches and dies, and the like. It also is invaluable for use in map making and reading, small instrument manufacture and assembly, engraving, counterfeit detection, fingerprint inspection and other work where magnification is required.

Each magnifier has a fluorescent daylight lamp, scientifically focused, which distributes natural light over object without shadow. Fluorescent lamp generates little heat and costs little to operate.

The lens is 5 in. in diameter, with focal length of 13 in., provides full magnified vision, and is securely mounted.

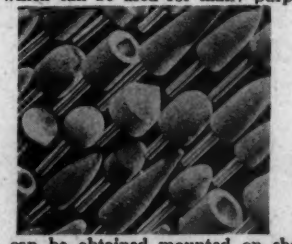
Frame and arms are die castings, ribbed for strength and rigidity, and the base and frame swivel joints and friction arm joints permit movement of lens to any desired position without moving base. The magnifiers operate only on alternating current (a.c.), 110–120 volts, 60 cycles.

Two models are available; No. 701 is for benchwork, or for use on conveyer belts or on machines. No. 701H is equipped with a hardwood handle for portable inspection anywhere in a plant.

For brief reference use IAVE—110.

MOUNTED GRINDING WHEELS

The Chicago Wheel and Manufacturing Co., 1101 West Monroe St., Chicago, Ill., are manufacturing a wide variety of mounted grinding wheels which can be used for many purposes.



They can be obtained mounted on shanks to fit any kind of chuck, and they are made in a wide range of grains and colors.

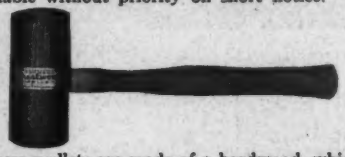
The wheels are made in colors to classify them for various purposes. Brown wheels, for instance, are suitable for hard materials and hard use. They will stand up in service. Green wheels are used for grinding materials of low tensile strength, like copper, aluminum, brass, glass, and some plastics. White wheels are used for grinding high speed steel, and other materials which have a tendency to burn. They are cooler and faster cutting, but do not have the life of brown wheels.

A descriptive manual on these mounted wheels may be obtained by writing to the firm.

For brief reference use IAVE—111.

BREUER ELECTRIC SOLVES MALLET PRIORITY PROBLEM

The Breuer Electric Mfg. Co., 5100 N. Ravenswood Ave., Chicago, Ill., have perfected a mallet that can be produced in any quantity and is available without priority on short notice.



These mallets are made of a hardwood, which is made still harder by a patented chemical and compression process.

They may be obtained in three sizes and weights for doing all types of driving, straightening, and hammering jobs. They are nonsplintering and are refaceable, thus making them long lived and useful over a long period of time.

For brief reference use IAVE—112.

A USEFUL CALENDAR FOR THE NEW YEAR

This new calendar, with its 52 weekly sheets, has big black numerals that can be easily read from any part of the drafting room. It has an over-all size of 15¾ by 24½ in.

The calendar also contains technical data for the engineer and draftsman consisting of charts on wire and sheet metal gauges, screw threads, etc.

Besides its functional value the calendar shows an illustration printed in six colors portraying the draftsman's importance in today's production.

As long as the supply lasts these calendars may

(Continued on page 29A)

TESTORS

CEMENT AND DOPE FOR MODEL AERONAUTICS

FIRST CHOICE OF AMERICA'S MODEL BUILDERS

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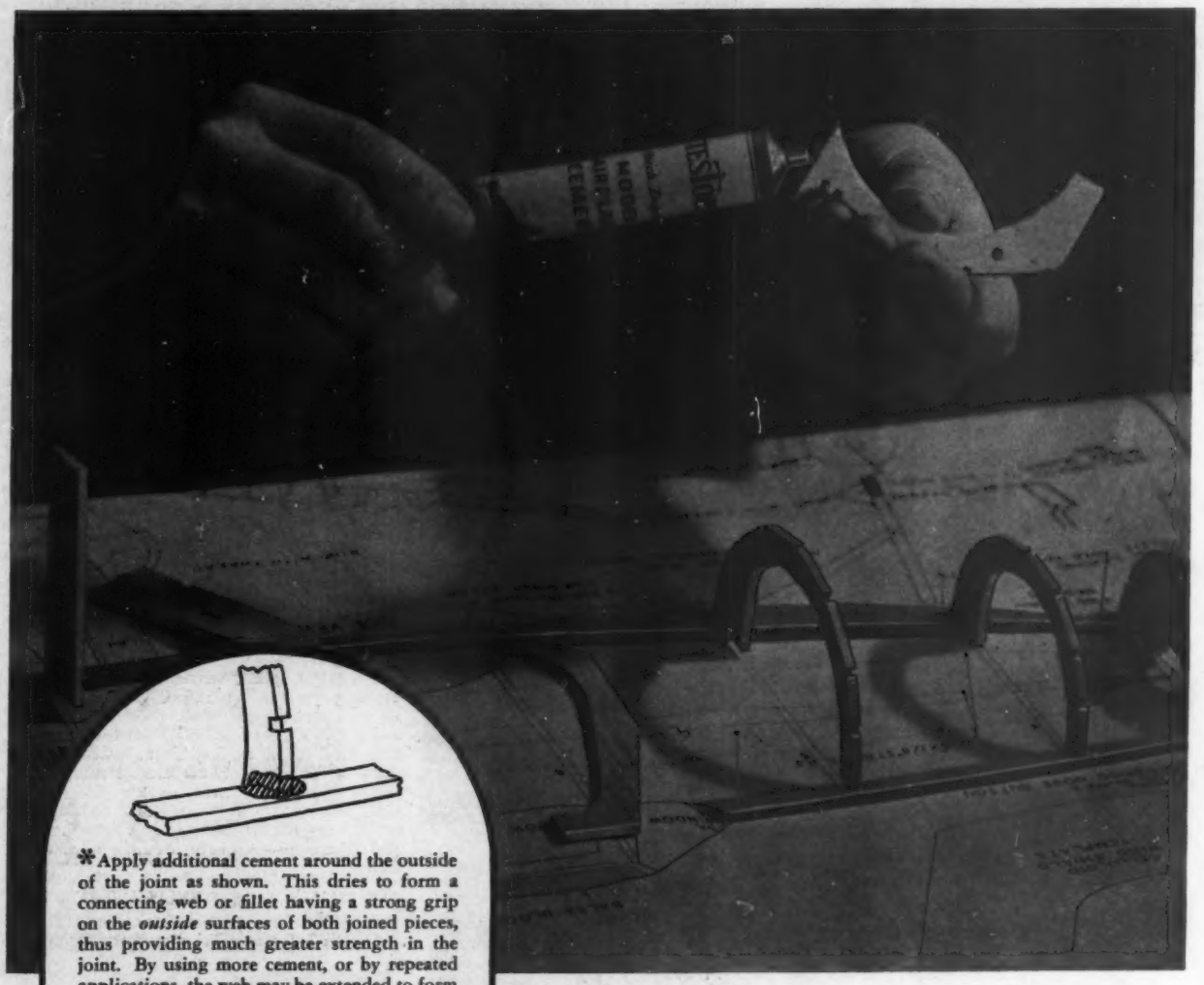
*HOW TO ADD GREATER STRENGTH TO BUTT JOINTS



*Apply additional cement around the outside of the joint as shown. This dries to form a connecting web or fillet having a strong grip on the *outside* surfaces of both joined pieces, thus providing much greater strength in the joint. By using more cement, or by repeated applications, the web may be extended to form a tough envelope around the entire joint. This filleting method is also useful in repairing broken butt joints.

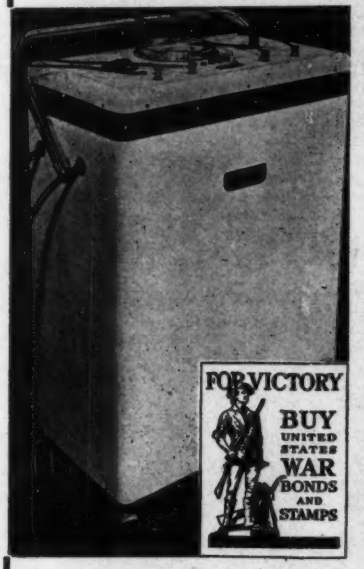
You will find these practical data sheets a helpful guide for your classes. May we suggest that you save and file the entire series.

Now! Get complete details about Testor's Model Airplane Cements and Dopes

TESTOR CHEMICAL CO., ROCKFORD, ILLINOIS, U.S.A.

WEIDENHOFF
CYCLONE *Battery* CHARGER

CONSERVING batteries is of utmost importance in the War effort. This modern, fast, reliable charger does the work. When properly used no danger of overcharging or overheating — usual causes of shortening battery life. Four scales on meter — push button controlled — easy to use. Meter can be used without interfering with charger operation. By bringing voltage up to normal a fully charged battery need not be temporarily used in place of car battery when setting voltage regulators. A time saver.



Built-in battery analyzer gives immediate and accurate indications of battery condition. Invaluable to instructor teaching fundamental principles and servicing of storage batteries. All of the essential parts — rectifier unit, transformer, meter, shunts, automatic overload protection, time clock, leads, etc., are based on sound engineering principles which have characterized Weidenhoff equipment throughout the years. Entire charging unit mounted in a beautiful cabinet.

You can get no better class room equipment for demonstrating modern battery charging and maintenance. Best of all, you can get it without priorities if you place your order quickly. Once you use it you will understand the reason for its popularity. Full particulars for the asking.

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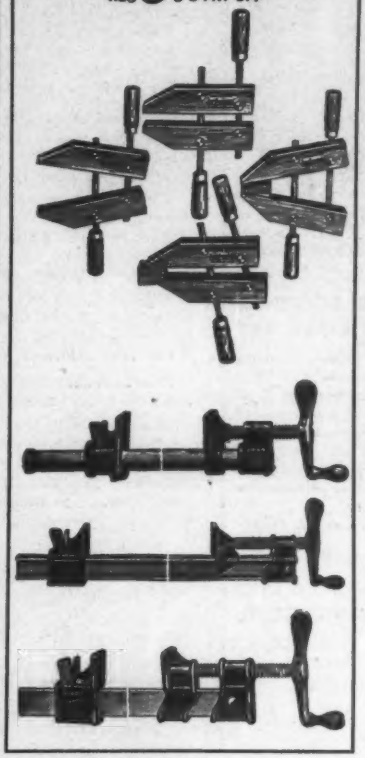

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Write for No. 16 General Clamp Catalog

ADJUSTABLE CLAMP CO.

"The Clamp Folks"

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(Continued from page 26A)

be obtained by addressing Frederick Post Co., Box 803, Chicago, Ill.

For brief reference use IAVE—113.

OILING THE LATHE AND CATALOG NO. 13

The second of a series of Lathe Service Bulletins issued in the interest of more efficient war production has just been published by the South Bend Lathe Works.

Oiling the Lathe strongly emphasizes the importance of proper lathe lubrication in maintaining maximum performance and accuracy. It outlines a regular procedure of oiling with proper lubricants at definite intervals.

This 19-page bulletin will be helpful to the operator of any size engine lathe, regardless of make. Copies of Bulletin H2, *Oiling the Lathe*, can be obtained free of charge from the South Bend Lathe Works, South Bend, Ind.

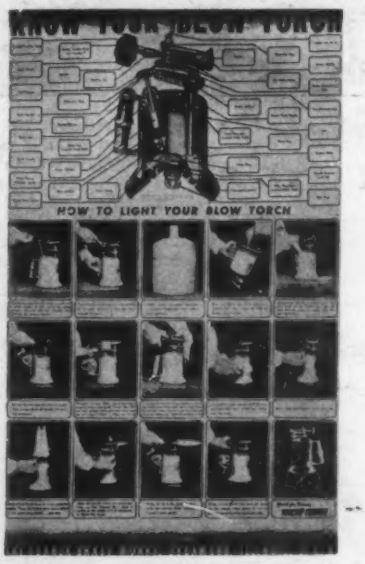
This firm also has just issued their new catalog No. 13 containing full information on South Bend 13-in. precision lathes. It is an 8-page, file size catalog and completely illustrates and describes South Bend 13-in. toolroom lathes and engine lathes, attachments, accessories, and tools for use with the lathes. A portion of the catalog is devoted to the construction features of the quick change gear box, carriage, spindle bearings, motor drive, etc.

These lathes have a 13⅛-in. swing over the bed and saddle wings, 11/16-in. collet capacity, and 1-in. spindle bore. They are made with several bed lengths that provide between centers capacities of 16 to 52 in. The eight spindle speeds provide a range from 34 to 875 r.p.m. A full page of tabulated specifications gives essential information on capacities, feeds, speeds, and dimensions.

For a copy of Catalog No. 13 write to the South Bend Lathe Works, Dept. 1A, South Bend, Ind.

BLOWTORCH WALL CHART

The Turner Brass Works, Sycamore, Ill., have prepared a wall chart which will be found useful in industrial-arts, vocational, and war-training classes, in which metalworking is taught.



The chart is in two colors, and shows a large sectional view of a blowtorch, and enlarged action pictures which illustrate step-by-step how to light and use this useful heating device.

A copy of the wall chart may be obtained by addressing a postal card to the firm, giving name, position, and school address.

For brief reference use IAVE—114.

LUMBER AND PLYWOOD CATALOG

Frank Paxton Lumber Co., Des Moines, Iowa, has issued a 36-page lumber and plywood price list for the school year 1942–43.

In it are described materials for archery, and information on the firm's lumber supply of white ash, balsa, basswood, beech, birch, butternut, Tennessee red cedar, Appalachian cherry, chestnut, cottonwood, red cypress, elm, quartered red gum, holly, magnolia, Honduras and Philippine mahogany, hard, soft, and bird's-eye maple, plain and quartered, white and red oak, California pine, yellow poplar, willow, and sycamore.

Veneers, panels, squares, and plywoods of various kinds are also listed.

For brief reference use IAVE—115.

CLAMPS FOR MANY USES

Catalog No. 16 of the Jorgensen Pony Clamps illustrates and describes many types of clamps used by workers in woods and metals.

Among the clamps described are the adjustable and nonadjustable hand screws; and the steel bar clamps of the I bar, rectangular bar, steel pipe, spring-steel bar, and wood bar types. Also *C* clamps designed for many uses, lathe dogs, clamp fixtures of many kinds, press screws, eccentric type clamps, and quick adjustable clamps.

For a copy of this catalog address: Adjustable Clamp Co., Chicago, Ill.

For brief reference use IAVE—116.

BOOKLET ON MILLING-MACHINE PRACTICE

This interesting booklet, entitled "Milling Machine Practice," gives an analysis of the process of milling; discusses the various types of milling cutters and the different kinds of work for which they are used; gives formulas for cal-

(Continued on next page)

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Catalog IA sent to teachers of Industrial Arts who specify school connection.

Metal Crafts Supply Co.

10 Thomas St. Providence, R. I.

(Continued from previous page)

culating cutting speeds, feeds, and the power required; and describes the several types of millers and milling-machine attachments that are available.

This instructional material has been made available by the Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio.

For brief reference use IAVE—117.

NEW AUTOMATIC ROTARY GELATIN DUPLICATOR

The new Model R-5, automatic rotary gelatin duplicator developed by Ditto, Inc., Chicago, Ill., is obtainable without priority restrictions.

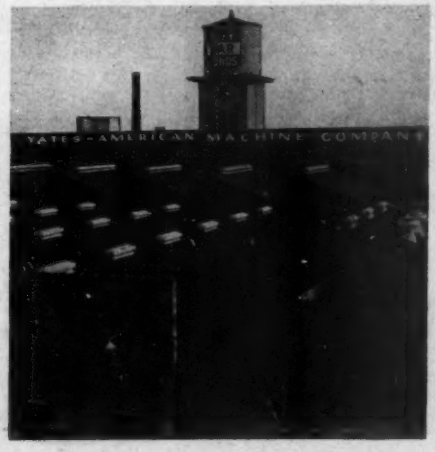
It may be had in both automatic and hand-fed models. It needs no stencils or type, and can reproduce eight colors simultaneously.

It produces up to 150 copies from the original typewritten, pencil, or ink original, and delivers as high as 40 to 70 copies per minute, depending upon whether the duplicator is of the hand-fed or automatic type.

For brief reference use IAVE—118.

YATES-AMERICAN CONTRIBUTION TO WAR BOND CAMPAIGN

The huge "Buy War Bonds" signs which appear on both the east and west sides of the water tank atop the three-story machine shop of the Yates-American Machine Company, at Beloit, Wis., have aroused a number of inquiries and much favorable comment.



According to Alvin Haas, president, "It is the firm's desire to advertise, through the medium of these signs, the finest product on earth — the United States of America and the American way of life. It is our hope that other commercial and industrial organizations, as well as individuals, may be inspired to 'shout from the housetops' the vital necessity of buying War Bonds to the limit."

New Publications

(Continued from page 24A)

thuse the man who has already learned how to carve.

The authors first describe the tools and materials required, and then give directions on how to make wall plaques, trays and book ends, jewelry, how to do figure carving, and carving of the human figure.

The book contains many fine designs that tempt almost anyone who has a knife to look for a piece of wood and start carving.

Jobs in the Foundry

By Ernest L. Bowman, Chief, Personnel Training Department, Ohio Bureau of Unemployment Compensation. Published by Science Research Associates, 600 South Michigan Ave., Chicago, Ill.

PRACTICAL SCHOOL SHOP JOINTER

H and A 6" Jointer, extra long tables, 42" overall, rabbetting type, automatic safety guard adjustable tilting fence, three knife round safety head, ball bearing boxes, made entirely of sand cast iron parts, free of die castings, ½ H.P. single phase motor, 110 volt, starter, bench type as shown.....$102.00
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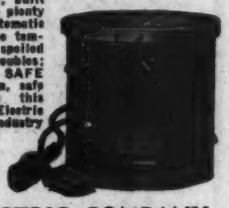

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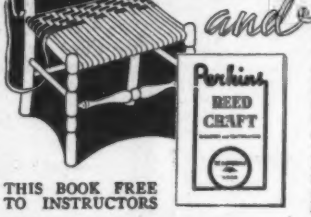

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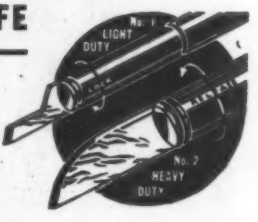

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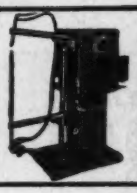

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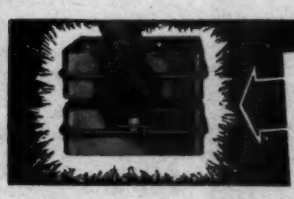

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Sheldon Machine Co., Inc 10A
Silk Screen Supplies, Inc. 30A
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Wallace Company, J. D. 8A
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Western Stoneware Co. 32A
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*Note: These books have been listed in Leaflet #53 issued by U. S. Office of Education

(TEAR OFF HERE AND MAIL TO US)

AMERICAN TECHNICAL SOCIETY
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Please send the following texts for 30 days ON APPROVAL examination. I will either return them at the end of that time or remit less your educational discount.

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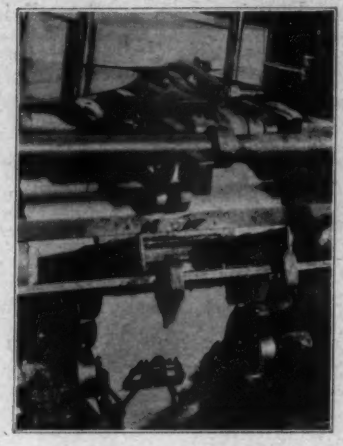
Part II

"Little Talks From Western"

High Speed Envelope Makers



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Down along the bottom of the machine they run still clasped by the drying chain as they pass over the drying oven at 300°F.—then curving up at the other end of the machine, they go into the folders where they are gummed and folded . . . each a PERFECT envelope . . . produced and stocked for thousands of customers throughout the Middlewest by Western States Envelope Co.

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Instructors, Write Today! . . . For your free manual and samples to increase your knowledge of envelope manufacturing.

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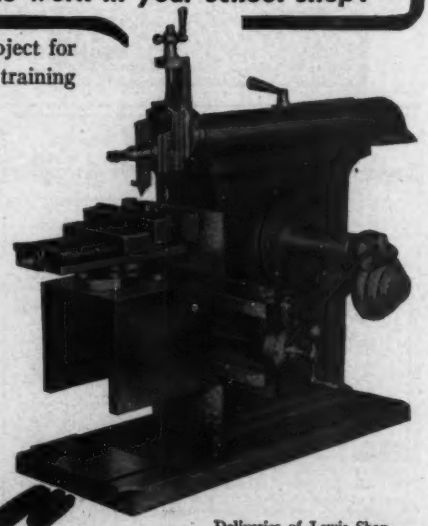
FINISH THIS LEWIS SHAPER

Then put it to work in your school shop!

• Here's an ideal project for your wartime training program . . .



FIRST — Complete this Shaper right in your own shop, letting your students do the work. Supplied as either rough or semi-finished castings, with engineering blueprints, instructions and all necessary parts. Your students study practical machine tool construction by actually doing the work . . . become thoroughly familiar with the tools they will operate in industry.

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Deliveries of Lewis Shapers, Milling Machines, Drill Presses — and more than twenty other metal and wood-working shop projects — are made from stock. Thousands of Lewis projects are in use in schools and colleges all over the world. *Send for new illustrated descriptive catalog giving complete information.* Quotations gladly furnished.

TECHNICAL BOOKS Which Prepare Your Students for a Man's Work in Military and Civilian War Jobs

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M. S. Matteson, Instructor, Boys' Technical High School, Milwaukee, Wis.

Each of the twenty-four lessons is planned to make the student master the theory of gas welding and cutting, then apply it. Step-by-step discussion tells how to use and care for equipment, types of joints, and other related facts. Brilliant instructive illustrations make these lessons especially clear for the beginner. *72 cents*

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Teacher's Manual, *10 cents* (free on adoption)

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THE BRUCE PUBLISHING COMPANY

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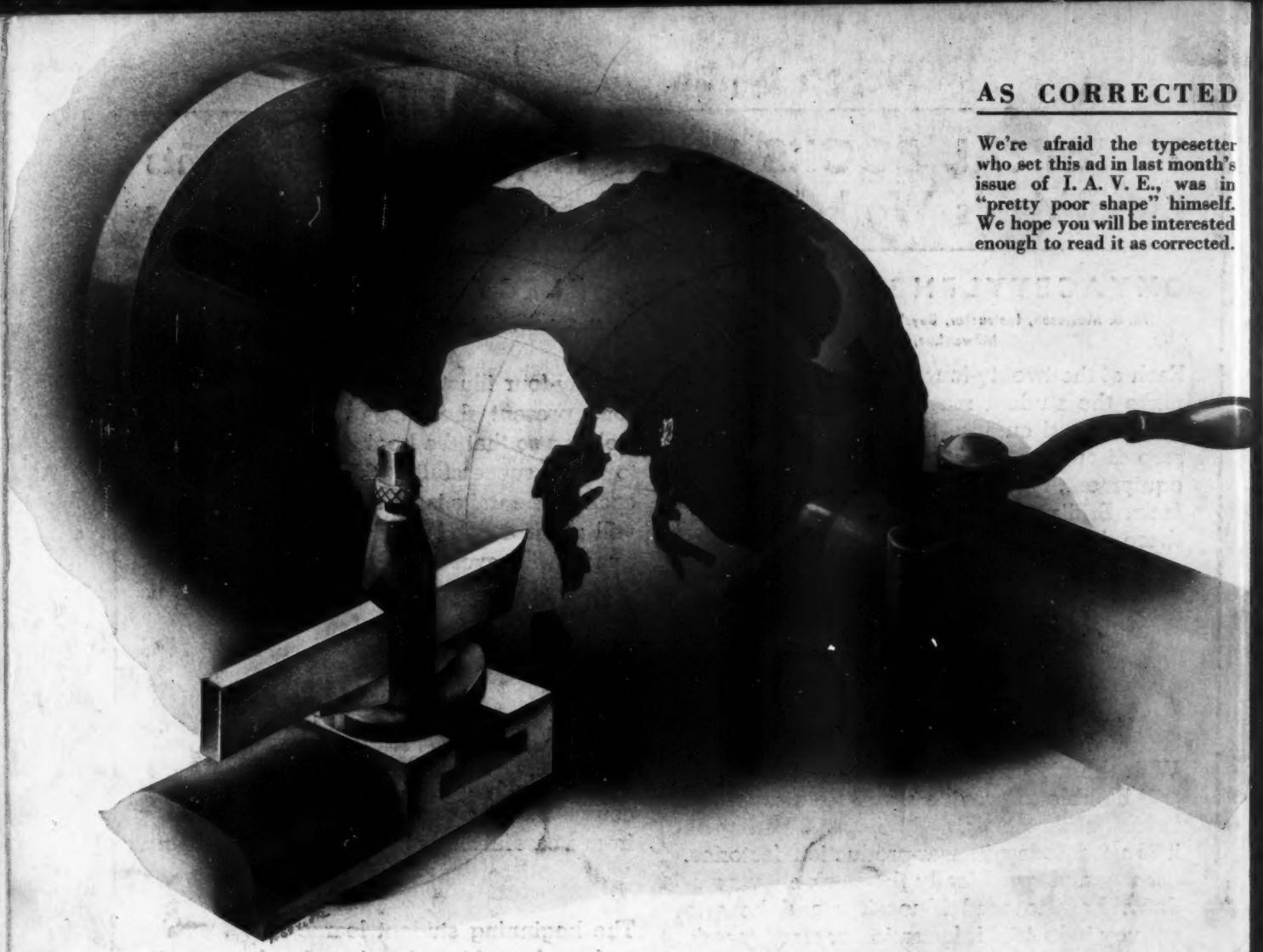

AS CORRECTED

We're afraid the typesetter who set this ad in last month's issue of I. A. V. E., was in "pretty poor shape" himself. We hope you will be interested enough to read it as corrected.

The World's in Pretty Poor Shape, Fellows . . . But You're the Guys Who Can Change it

You men training in our industrial schools are here to learn in a hurry the business of war production. And until the war is won, you'll work at little else. But when the Armistice is signed, this battered world will still take a lot of fixin'. It will be up to men behind machines to rebuild what has been destroyed and to carry to the "have not" nations our own high standard of living. You are the ones who can lead us away from further strife. All humanity is praying that you will do your job well.

The R. K. LeBLOND MACHINE TOOL CO., CINCINNATI, OHIO
Largest Manufacturer of a Complete Line of Lathes

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